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* General studies, see also individual crops.

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Plant Breeding Abstracts

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*STATISTICS

2970 Hanson, W. D.
General concept of and considerations for the use of variance components.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 403–09.

A general exposition of the principle of additivity of variance components is presented.

2971 Le Roy, H. L.
Zwei bekannte statistische Prüfverfahren im Lichte neuester Erkenntnisse. (**Two standard statistical tests in the light of the most recent knowledge**).
Schweiz. landw. Mh. 1956 : **34** : 285–97.

A description is given of the sequential range test and the sequential *F* test for comparing more than two means or factors.

2972 Ortlepp, H.
Zur Anwendung einiger Versuchsmethoden im Feldversuchswesen. (**On the application of some experimental methods to field trials**).
Z. landw. Vers.- UntersuchWes. 1955 : **1** : 300–11.

Data obtained by three cereal uniformity trials are used in a comparison of the relative merits of Lindhard's method, Mitscherlich's method, systematically arranged blocks, randomized blocks and the Latin square. Analysis of variance is adequate in most cases except where the soil differences are large or unknown, in which case Lindhard's method is preferred.

2973 Horváth, A. & Svab, J.
Uj elgondolások a szántóföldi kísérletek értékelési módszére. (**New concepts in methods of evaluating field trials**).
Növénytermelés 1955 : **4** : 43–66.

The method of statistical analysis referred to in Abst. 1943 is further developed and its application is illustrated with reference to a trial of sugar-beet varieties.

2974 Schultz, E. F. (Jun.)
Optimum allocation of experimental material with an illustrative example in estimating fruit quality.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 421–33.

Optimum allocation formulae are derived whereby the degree of information required from an experiment can be brought into line with the expense which the experimentalist is willing to incur. An example is worked out with reference to determination of fruit firmness in peaches.

*GENETICS

2975 Prezent, I. I.
(**Luther Burbank**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 5 : p. 50. [Russian].

This article commemorates the 30th anniversary of the death of Burbank, whose achievements as a plant breeder and exponent of Darwinism are commented on appreciatively from the Mičurinist viewpoint.

2976 Breider, H.
Begriffswandel in der Genetik. (**A change of concept in genetics**).
Bayer. landw. Jb. 1956 : **2** : 131–44.

In this popular account of recent advances in genetics, the author discusses theories on the nature and chemical composition of the gene, cytoplasmic inheritance, the mode of action of suppressor genes, the induction of mutations and gene inactivation by X irradiation and chemical means, and the occurrence of somatic mutations in vegetatively propagated plants such as the grape vine.

2977 Hudson, P. S.
Agricultural delegation to Russia.
Seed Tr. Rev. 1956 : **8** : 31–35.

The substance is given of an address to the Seed Trade Association of the United Kingdom on 23 January 1956. A member of the British Agricultural Delegation to Russia in 1955, the speaker described his visits to various institutes engaged in crop breeding and his impressions concerning the status of Lysenkoist genetics.

2978 Hudson, P. S.
The harrowing of Lysenko.
Agric. Rev., Lond. 1956 : **2** : No. 1 : 45–46.

After outlining the principles adopted by Lysenko, the author briefly describes how these principles have recently fallen into disfavour in the USSR.

2979 Rhoades, M. M.
Lewis John Stadler.
Genetics 1956 : **41** : 1–3.

An obituary account is given of Stadler's career as a geneticist.

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* General studies, see also individual crops.

2980 Portères, R.
Histoire de la génétique. Les lois de Mendel et de Naudin auraient pu être établies dans le premier quart du XIX^e siècle. (**History of genetics. The laws of Mendel and Naudin could have been established in the first quarter of the nineteenth century**).
J. Agric. trop. Bot. appl. 1956 : **3** : 92–93.

Observations made in 1813 by the French botanist de Candolle are cited in support of the hypothesis that segregation in hybrid progeny had attracted attention before Mendel and Naudin formulated their theories on the subject.

2981 El-Ibiary [Al Ibiari], H. M.
Estimation of the number of segregating loci in some cases of quantitative inheritance.
Alexandria J. agric. Res. 1954 : **2** : No. 2 : 1–8.

The Castle-Wright formula for estimating the number of segregating loci in quantitative inheritance is extended (1) to utilize the difference between the F_1 and F_3 variance and B_1 variance and (2) with various assumptions as to dominance.

2982 Eversole, R. A. & Tatum, E. L.
Chemical alteration of crossing-over frequency in *Chlamydomonas*.
Proc. nat. Acad. Sci. USA 1956 : **42** : 68–73.

Eversole, R. A.
Crossover frequency studies with biochemical mutants of *Chlamydomonas*.
Diss. Abstr. 1956 : **16** : Publ. No. 16,021 : p. 636.

Frequency of crossing over in *Ch. reinhardi* was increased by treatment with a chelating agent or MnCl. The effect of either agent was reversed by subsequent incubation of the cells in high concentrations of Ca or Mg ions. The sensitivity of crossing over to ionic environment is consistent with the hypothesis that chromosomes are composed of macromolecular units associated with divalent ions.

2983 Serra, J. A.
Química dos cromosomas e genes. (**Chemistry of the chromosomes and genes**).
Portug. acta biol. 1955 : Sér. A. : **4** : 153–213.

A general review of current knowledge on nuclear biochemistry and on the genetical significance of the chemical constitution of the chromosomes is presented. Among the topics treated are salivary chromosomes, resting nuclei, the twin-helical formula of DNA, the chemistry of the nuclear membrane, nuclear fluid and nucleolus, the chemical identity of the gene and the storage and transfer of genetic information in the cell.

2984 Pringle, C. R.
Antigenic variation in *Paramecium aurelia*, variety 9.
Z. indukt. Abstamm.- u. VererbLehre 1956 : **87** : 421–30.

The system of antigenic variation in variety 9 of *P. aurelia*, taken from a pond in Edinburgh, was studied and found to be basically similar to the systems of varieties 1 and 4 (cf. *PBA**, XIX, Abst. 721 and XXII, Abst. 1581). Two serotypes, a G type and an X type, were distinguished; a series of five allelic genes controlled the specificity of the G type and a further seven alleles that of the X type. Although no two types in the three different varieties of *P. aurelia* hitherto studied are identical, cross reactions occur between some of the G types of variety 9 and some of the G types of variety 1.

2985 Allard, R. W.
The analysis of genetic-environmental interactions by means of diallel crosses.
Genetics 1956 : **41** : 305–18.

"In the genetical description of continuous variation, the phenotypic effects of genes can be specified in many cases by three types of parameters, *d*, *h*, and *i*, denoting the increments due to additive effects of genes, dominance, and non-allelic interactions, respectively. An extension of the analysis of diallel crosses is presented which permits an assessment of the stability of the value assumed by *d*, *h*, and *i* under different environmental circumstances. "Application of the method to date of flowering and height data for intervarietal hybrids of *Nicotiana rustica* suggested that non-allelic interaction was unimportant in the genetic control of the former but a regular feature of the genetic control of the latter character. For date of flowering the additive genetic effects were comparatively stable, but the dominance effects of genes appeared to be quite unstable in different environments. In the genetic control of height non-allelic interaction of a complementary type was inferred, and it proved to be quite stable in different environments.

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* *Plant Breeding Abstracts.*

Dominance relationships in the genetic control of height appeared to shift only moderately with environmental changes, but the additive effects of genes controlling height were altered drastically by environmental changes."

[Author's summary]

2986 ROBERTSON, A.
The effect of selection against extreme deviants based on deviation or on homozygosis.
J. Genet. 1956 : **54** : 236–48.

In the first part of this paper, the author analyses the effect of selection of individuals close to the population mean and selection of mates from opposite extreme phenotypes on gene frequency. The effect of the first procedure is to bring about gene fixation; in the second, an equilibrium with intermediate gene frequency is to be expected. The second part analyses some implications of Lerner's theory of genetic homeostasis (cf. *PBA*, XXV, p. 102) in particular, the rate of relaxation to the population mean when selection is stopped. This rate is proportional to the "homeostatic strength" of the character considered; this value is equivalent to the mean fitness of the homozygotes compared with that of the heterozygote weighted according to the variance contributed by the locus concerned.

2987 HALDANE, J. B. S.
The estimation of viabilities.
J. Genet. 1956 : **54** : 294–96.

"If a sample contains a of a phenotype A and b of a phenotype B, where equal numbers of the two types are expected, then b/a is a biased estimate of the relative viability of B; and $b/(a + 1)$ is an almost unbiased estimate."

[Author's summary].

2988 DICKINSON, A. G. & JINKS, J. L.
A generalised analysis of diallel crosses.
Genetics 1956 : **41** : 65–78.

The method of analysing data from diallel crossing devised by the authors and referred to in *PBA*, XXV, Absts. 2624 and 2625 is generalized to extend to heterozygous parents. Estimates of overall degree of dominance, the inbreeding coefficient and allele frequency at loci showing dominance are obtained.

2989 COCKERHAM, C. C.
Effects of linkage on the covariances between relatives.
Genetics 1956 : **41** : 138–41.

"In randomly mating diploid populations whose genotypic frequencies are in linkage equilibrium, the covariances between relatives of which one is an ancestor of the other are not affected by linkages, provided position effects are absent. In contrast, covariances between relatives where one is not an ancestor of the other are affected by recombination frequencies less than one half. The lower the recombination frequency, the higher the covariance, and the bias is in the amount of the epistatic components that appears in the covariances and not in the amount of additive genetic and dominance components. Explicit expressions are given for full sibs and half sibs up to and including three factor epistatic components." (Cf. *PBA*, XXV, Abst. 2626).

[Author's summary].

2990 BREIDER, H.
Weitere Ergebnisse der Mutationsforschung. (**Further results of mutations research**).
Strahlentherapie 1955 : **98** : 616–27.

In this short general survey of mutation the following topics are discussed: artificial induction of mutation; the use of mutants in biochemical studies and in breeding; the interaction of mutation and natural selection in evolution; ionizing radiations and human genetics; and somatic mutation.

2991 CAVALLI-SFORZA, L. L. & LEDERBERG, J.
Isolation of pre-adaptive mutants in bacteria by sib selection.
Genetics 1956 : **41** : 367–81.

Use of a replica-plating method of indirect selection of drug-resistant mutants, i.e. in the absence of the agent, has already been reported (cf. *PBA*, XXII, Abst. 2498). A procedure of indirect selection, by subculturing progressively smaller samples in liquid media, is now described, this technique being more amenable to quantitative control than the earlier one. Using the new procedure, evidence has been obtained supporting the hypothesis that mutants of *Escherichia coli* showing first-step resistance to streptomycin or chloramphenicol are preadaptive.

2992 HAUSTEIN, E.
Die Mutante *chlorina* der *Oenothera Berteriana*. (**The *chlorina* mutants of *Oe. berteriana***).
Ber. dtsch. bot. Ges. 1956 : **69** : 143–48.

Light-green mutants of *Oe. berteriana* found by Schwemmle in 1942 are described; the mutation is attributed to the action of a single recessive pleiotropic gene, designated *chl*. Plants with *chl* contain less yellow and green pigment compared with normal plants, are smaller and less vigorous and have broader primary leaves.

The style is shorter and petal spotting less pronounced.

When those F_2 segregates of crosses between mutants and nonmutants that contained *chl* were compared with progenies obtained by selfing mutant plants it was observed that all the characters determined by *chl* were less pronounced in the former group than in the latter. Possible reasons for the partial inactivation of *chl* in the F_2 hybrids are suggested; the phenomenon may be linked with the influence of plastids contained in the cytoplasm or possibly be due to a change, under the influence of *chl,* in the cytoplasm in the F_1 generation. Further research to elucidate the problem is being carried out.

2993 HANSON, E. D.
Spontaneous mutations affecting the killer character in *Paramecium aurelia,* variety 4.
Genetics 1956 : **41** : 21–30.

Of the two mutations described, one is a nuclear change causing loss of κ. It may involve loss of the locus K or consist of a gene mutation at, or closely linked with, this locus. The other is localized in κ itself and is characterized by a reduced maximum reproductive rate of the particles.

2994 SCHWANITZ, F.
Grossmutationen. **(Macromutations).**
Umschau 1956 : **56** : 45–48.

Examples of species in which macromutations have occurred, resulting in features characteristic of different species, genera or higher taxa, are given and include *Antirrhinum,* some mutants having spurred flowers and others single cotyledons, and *Linaria,* in which mutants with actinomorphic flowers have been found. The mutant character is generally rather variable but can be stabilized by selection. It is suggested that, through being subjected to natural selection under different environments, macromutations have been of importance in the evolution of taxonomically distinct categories.

2995 L'energia atomica al servizio dell'agricoltura. **(Atomic energy in the service of agriculture).**
Ital. agric. 1956 : **93** : 191–94.

In referring to the Geneva conference on the peaceful uses of atomic energy, the author mentions some of the useful mutants obtained in agricultural plants, including barley and wheat mutants resistant to certain races of rust and erectoid barley mutants resistant to lodging.

2996 ŞELKOVNIKOV, S. Ş. [ŠELKOVNIKOV, S. Š.].
Cu privire la problema "Malthusianismului" in biologie. **(On the problem of "Malthusianism" in biology).**
An. Romîno-Soviet : Ser. Biol. 1955 : No. 2 : 112–32.

A Rumanian version of the Russian paper summarized in *PBA,* XXV, Abst. 665 is given.

2997 POLJAČENKO, V. P.
(Scientific session commemorating the centenary of the birth of the eminent scientist-biologist I. V. Mičurin).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 1 : 42–48. [Russian].

Abridged accounts of addresses made at the Moscow meetings commemorating Mičurin in October 1955 are given. A report was presented by Lysenko, in his capacity as president of the Lenin Academy of Agricultural Sciences, who on this occasion was awarded the Mičurin medal.

2998 SOROKIN, C. & WHALEY, W. G.
Intra-species relationships and Lysenko's concept of a species.
J. Hered. 1956 : **47** : 41–44.

From a reanalysis of Lysenko's data on kok-saghyz (cf. *PBA,* XVII, Abst. 585), evidence of intraspecific competition is obtained. It is shown that for any one plant in a cluster, development depends chiefly on the number and size of all the plants in the cluster heavier than it and to a lesser extent on the development of the weaker plants. The competitive relationships between any two members of a group depend not only on their relative strength but also on the competing influence of other members of the group and therefore on the size of the population.

EVOLUTION

2999 DEYL, M.
Diminishing and repeated variations in the evolution of plants.
Studia bot. čechosl. 1950 : **11** : 245–61.

Three stages of evolution are postulated. The euryplastic stage is characterized by great evolutionary potentiality and the capacity to initiate the highest taxonomic units. Next comes the stenoplastic stage when the plasticity and evolutionary potentiality of some features diminish, while other features of a lower taxonomic value remain evolutionarily plastic; it is at this stage that genera and families arise. At the pseudoplastic stage evolutionary plasticity comes to an end, but not morphological, anatomical and physiological plasticity. This stage is characterized by the formation of species.

3000 Hohlov, S. S.
(The problem of the origin of species in the works of I. V. Mičurin).
Bot. Ž. (Bot. J.), Moskva 1955 : **40** : 667–79. [Russian].

Mičurin's views on the origin of species, natural selection, acquired characters and the evolutionary role of hybridization are outlined.

3001 Wright, S.
Modes of selection.
Amer. Nat. 1956 : **90** : 5–24.

Mainly with reference to animal organisms, the author discusses evolution in relation to the following: selection among genes and cells; selection under conditions of exclusive uniparental reproduction; mass selection; pleiotropic threshold in the selective advantage of a gene; multiple peaks in selective value within a single population; incompatible adaptations; effects of a changing environment; alternation of uniparental and biparental reproduction; interdeme or intergroup selection; some misunderstandings of the role attributed by the author to random drift; synergic effects of random processes; macromutations; reciprocal translocations; introgressive hybridization; and selection among noninterbreeding species and higher categories.

3002 Straw, R. M.
Floral isolation in Penstemon.
Amer. Nat. 1956 : **90** : 47–53.

The rare occurrence of natural hybridization among four sympatric and interfertile species of *Pentstemon* in California is attributed to the floral isolation consequent upon diversity in flower type and the concomitant restriction of particular pollinators to each species. The observations recorded in this paper provide the basis of the author's suggestions, made in an earlier paper, concerning the general significance of floral isolation in sympatric speciation (cf. Abst. 1976).

*CYTOLOGY

Proceedings of the 348th Meeting of the Biochemical Society held at the London School of Hygiene and Tropical Medicine, Keppel Street, London, on Saturday, 18th February, 1956.
Biochem. J. 1956 : **62** : No. 4 : 39p–41p.

3003 *Markham, R. Recent views on the chemical structure of the polynucleotides. (p. 39p.).*

A general review is given of recent work on the structure of RNA and DNA.

3004 *Wilkins, M. H. F. Structure of deoxyribosenucleic acid and nucleoprotein and its possible bearing on protein synthesis. (p. 40p.).*

There are two helical grooves in the surface of DNA, assuming that some form of the twin-helical structure proposed by Watson and Crick is correct. In sperm heads the protamine molecule is wound round the shallower of the two grooves. The histone appears to be attached differently.

3005 *Askonas, B. A., Simkin, J. L. & Work, T. S. Nucleic acids and protein synthesis in animal tissues. (p. 40p.).*

Synthesis of protein from radioactive aminoacids has been shown to proceed most rapidly in the ribonucleoprotein fraction of the microsomes.

3006 *Gale, E. F. Nucleic acids and the incorporation of amino acids. (pp. 40p.–41p.).*

Incorporation of aminoacids without protein synthesis often occurs. Incorporation in fragmented cell preparations requires an energy source which can be supplied by ATP; there appear to be a number of factors associated with RNA which promote incorporation of specific aminoacids, but these factors are not themselves nucleotides.

3007 *Burton, K. Interrelationships of nucleic acid and protein in the multiplication of bacteriophage. (p. 41p.).*

Synthesis of phage DNA in T2, although requiring protein synthesis for its initiation, can proceed thereafter in the absence of protein synthesis. It therefore seems that a protein template is not involved in the synthesis of phage DNA.

3008 Grun, P.
Changes during interphase in nucleic acid and protein content of *Tradescantia* root tip nuclei.
Exp. Cell Res. 1956 : **10** : 29–39.

Using the ultraviolet microspectrophotometric technique, increase in size of the interphase nuclei of *T. paludosa* was found to be accompanied by an increase in total nucleic acid content but not by any change in total protein content. Protein synthesis must therefore occur some time between prophase and telophase. The nuclei of differentiated cells were on the average larger than those in the meristem and contained more nucleic acid but not a higher amount of protein.

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* General studies, see also individual crops.

3009 SNOAD, B.
The behaviour of nucleoli in *Phaedranassa carmioli*.
Exp. Cell Res. 1956 : **10** : 78–87.

Investigations at the John Innes Horticultural Institution, Hertford, England, have shown that during meiosis in *Ph. carmioli* one of the two nucleoli ordinarily present is included within the other, and that these nucleoli differ markedly in chemical constitution. At mitosis the nucleoli fuse and show no differential reactions in staining or cytochemical tests. With the application of heat shock to prevent chromosome pairing, the nucleoli, whether "fused" or separate, were not differentiated at meiosis, except after staining with acetocarmine. It is suggested that a genic difference between the nucleolar organizers is expressed only under certain metabolic conditions in the cell. It was in addition observed that normally inactive nucleolar organizers were stimulated into activity by heat shock, small and very weakly-stained nucleoli being formed.

3010 WOLL, E.
Zur Abgabe von Nucleolusstoffen an das Cytoplasma. (**The discharge of nucleolar material into the cytoplasm**).
Planta 1956 : **47** : 299–302.

Discharge of material from the nucleolus into the cytoplasm has been observed in living glandular cells of the vine using a phase-contrast microscope.

3011 PIZA JUNIOR, S. DE T.
Cromossômio, unidade genética. (**The chromosome, the genetic unit**).
Rev. Agric., Piracicaba 1956 : **31** : 1–27.

Citations are given from the works of the author and other investigators in support of the concept that the chromosome is longitudinally and dorsiventrally differentiated and functions as the unit of heredity. It is pointed out that geneticists are becoming less rigid in their ideas about the gene and the notion of the chromosome unit is spreading, as is that of cytoplasmic inheritance; many of the ideas expressed recently are shown to be almost identical with those put out by the author over twenty years earlier.

3012 LIMA-DE-FARIA, A.
The role of the kinetochore in chromosome organization.
Hereditas, Lund 1956 : **42** : 85–160.

In a comprehensive survey of investigations carried out by himself and other workers on the centromere in plants and animals, the author discusses (1) the structure and properties of this region, (2) genetical aspects such as the centromere as a tandem reversed repeat, induction of breakage, structural and functional variation and chemical composition, (3) the interrelation and interaction of the centromere with other chromosome regions and (4) the evolutionary and morphological implications of the chromosome field (cf. *PBA*, XXIV, Abst. 2643).

3013 FRITZ-NIGGLI, H.
Mitoseaktivität und Phasenhäufigkeit nach Bestrahlung von *Vicia faba* mit 31 MeV- und 180 keV-Röntgenstrahlen. (**Mitosis activity and phase frequency after irradiation of *V. faba* with 31 MeV and 180 keV X-rays**).
Naturwissenschaften 1956 : **43** : 112–13.

Irradiation of root-tip cells of seedlings with 31 mV or 180 keV had an inhibitory effect on mitosis, the effect of 250 r. of 180 keV being equivalent to that of 500 r. of 31 MeV. Prophase was prolonged and the number of cells at anaphase and telophase considerably reduced.

3014 MAEDA, T.
(**Chromosome association and separation. II. Results of some observations on the broad bean**).
Senshokutai (Chromosome)/Kromosomo 1955 : No. 25–26 : 902–06. [Japanese].

Continuing his studies on chromosome behaviour during meiosis (cf. Abst. 875), the author describes meiosis in *Vicia faba*. The transition from the tightly twisted pachytene chromatids to their condition at diakinesis is accomplished by simple unwinding. In most of the m bivalents, the short arms do not form chiasmata; in the M bivalents, chiasmata occur on both arms but in various positions. These observations are used as a basis of criticism of the neo-two-plane theory of Matsuura (cf. *PBA*, XIX, Abst. 1596 and XXI, Abst. 2308).

3015 KATO, Y.
Responses of plant cells to gibberellin.
Bot. Gaz. 1955 : **117** : 16–24.

Gibberellin ($C_{22}H_{26}O_7$) obtained from the culture medium of *Gibberella fujikuroi*, induced pseudochiasmata in roots of *Allium cepa*. It also induced mitosis in differentiated regions of the roots.

3016 Beatty, A. V., Beatty, J. W. & Collins, C.
Effects of various intensities of X radiation on chromosomal aberrations.
Amer. J. Bot. 1956 : **43** : 328–32.

As previously reported, the frequency of chromosome aberrations in *Tradescantia* decreased when irradiation took place in pure oxygen but increased in helium, as the rate of applying a total dose of 400 r diminished (cf. Abst. 882). It is suggested that the metabolic disturbance brought about by depletion of oxygen in the cells caused delay in the rejoining of the broken ends of the chromosomes, reunion thus being favoured at the expense of restitution, with the consequence of higher frequencies of aberrations with the longer times in helium at the lower intensities of radiation.

3017 Moutinho-de-Oliveira, M. & Cabral, M. T.
The action of β rays on root meristems of *Allium cepa*.
Portug. acta biol. 1955 : Sér. A. : **4** : 297–314.

After treatment with β rays from Sr^{90}, such effects as dispersion of the nuclei into particles, chromatic rarefaction, chromatic agglutination and lobed nuclei were produced in resting cells. Intense agglutination, often leading to the formation of bridges and pseudobridges, was observed in dividing cells, as well as chromosome fragmentation. The abnormalities were independent of the dosage. Most types of disturbances also appeared in neighbouring cells protected from direct irradiation.

The fragmentation may however have been entirely or partly produced during preparation by the squash technique. The condition induced in the nuclei was such that slight pressure on the cover slip while the balsam was still somewhat fluid was sufficient to cause fragmentation.

3018 Stange, L.
Zur Frage nach dem Einfluss der Temperatur bei der Auslösung von Chromosomenmutationen in der Meiosis durch Röntgenstrahlen. (**On the question of the influence of temperature on the induction of chromosome mutations during meiosis by means of X rays**).
Z. indukt. Abstamm.- u. VererbLehre 1956 : **87** : 431–38.

The frequency of chromosome fragmentations, translocations and other irregularities was studied in the inflorescences of *Oenothera* plants that had been subjected to a dose of 300 r. Temperatures of 5, 10, 20 and 25° C. during irradiation did not affect the number of chromosome breaks induced or the numerical relationship of translocations to fragmentations; the same applied to tests in which the plants were exposed to temperatures of 10 or 20° C. for 5 hr. before or after irradiation or for 12 hr. after irradiation. When the plants were exposed to a temperature of 20° C. for 36 hr. after irradiation, however, a larger number of chromosome breaks were observed than when they were exposed to 10° C. for the same period; at the higher temperature a smaller number of translocations and a greater number of fragmentations were observed than at the lower temperature. It is concluded that, to have an influence on the number of chromosome breakages induced, temperature effects must be prolonged for a period of more than 12 hr.

3019 Tiele-Winckler, E.-B. von
Codein als hemmende Substanz bei der Auslösung von Chromosomenmutationen von *Oenothera*. (**Codeine as an inhibitory substance in the induction of chromosome mutations in *Oenothera***).
Z. indukt. Abstamm.- u. VererbLehre 1956 : **87** : 338–55.

The sensitivity of *Oenothera* inflorescences to X rays was considerably reduced by standing the stalks in a 1/500 M codeine solution for 24 hr. before irradiation. When the inflorescences were subjected to a dose of 300 r. the number of chromosome fragments and translocations observed was 3·8 times as great in inflorescences that had not been treated with codeine as in those that had received this treatment. On the other hand, a combination of X irradiation and codeine treatment resulted in an increase in the frequency of local achromasies.

3020 Sharma, A. K. & De, D. N.
Heterocyclic bases. An aspect of their use in cytochemistry.
Phyton 1956 : **6** : 23–46.

Investigations have been carried out at the Botany Department, Calcutta University, India, to determine the effects of guanine, uracil and maleic hydrazide upon the chromosomes in root tips of *Allium cepa* and other monocotyledons and *Lathyrus sativus*, *Pisum sativum*, *Lens esculenta* and *Vicia sativa*, using the acetoorcein and Feulgen squash techniques. The duration of the treatment and concentration required for any one chemical to have certain effects varied according to the species. In the case of guanine and uracil, treatment of a given species with a particular concentration or range of concentrations for a specified period revealed details of the chromosome structure, provided treatment was effected at 12°–16° C. These concentrations were lower than those necessary for subnarcotic effects. With uracil, duration of treatment was however a more decisive factor than concentration in determining the conditions required for maximum clarifications of chromosome structure; in the case of guanine, concentration was of primary importance. Certain treatments with guanine and uracil induced fragments, which degenerated after a period of recovery. Micronuclei were frequently observed after fragmentation induced by guanine. No localization of breakage could be detected, possibly because the fragmentation induced was too severe. No fragmentation was observed after treatment with maleic hydrazide.

3021 GÜNTHER, H., HEINRICH, H. & SCHMERMUND, H.-J.
Über die Wirkung von Röntgenstrahlen und N-Oxydlost auf die Wurzelspitzenmitosen von *Vicia faba equina*. **(On the effect of X rays and N-oxide mustard on mitosis in the root tips of *V. faba equina*).**
Naturwissenschaften 1956 : **43** : 164–65.

A concentration of 1 : 40,000 methyl-bis-(β-chlorethyl)amine-N-oxide hydrochloride slowed down mitosis to the same extent and brought about the same number of fragments and bridges at anaphase as did an X-ray dose of 100 r. When cells were subjected simultaneously to the above doses of the mustard and X rays the effect was additive, equalling that of an X-ray dose of 200 r.

3022 SHARMA, A. K. & MOOKERJEA, A.
Induction of division in cells—a study of the causal factors involved.
Bull. bot. Soc. Beng. 1954 (1955) : **8** : 24–100.

Onion root tips were treated for 1–168 hours with solutions of (*a*) any one of 15 sugars and (*b*) mixtures of levulose, dextrose or xylose with a hetercyclic base and a phosphate. Most of the sugars induced division in polyploid cells formed before treatment, levulose being the most effective. Among the mixtures, those containing levulose or xylose produced the most marked effects. The daughter cells produced did not normally undergo further division. Somatic reduction was also occasionally induced, more frequently in normal than in polyploid cells, and other abnormalities of division were sometimes observed. The possible modes of action involved are discussed and it is suggested that the different substances either affect the respiratory processes of the cell, providing the energy necessary for increased cell division, or act directly by supplying the constituents necessary for an enhanced production of nucleic acids.

3023 VIVEIROS, A. & MANARTE, M.
Acção de extractos de tabaco sobre a mitose. **(Action of tobacco extracts on mitosis).**
Portug. acta biol. 1954 : **4** : 81–85.

Aqueous extracts of tobacco caused the formation of c-tumours and induced chromosome contraction in the roots of *Allium cepa*. Tobacco smoke did no more than induce the roots to grow twisted.

3024 GAŠKOVA, V.
(The effects of some products of a breakdown of nucleic acids upon cells in the meristematic tissues).
Studia bot. čechosl. 1950 : **11** : 174–90. [Russian].

Adenine, xanthine and uracil disrupted cell metabolism in the root meristems of *Allium cepa*, with uracil and specially adenine causing reduction in mitotic activity. The action of adenine is described as analogous to that of mitotic toxins and mutagenic agents.

3025 CARVALHO, J. M. DE
Induction of chromosome breakage with bacterial products. The origin of mutations.
Bol. Soc. broteria. 1955 : **29** : 145–83.

Immersion of root tips of *Vicia faba* in bacterial cultures for 6 or 12 hr. resulted in reciprocal translocations, anaphase bridges and fragments, dicentrics and other evidence of breakage. The origin of most of the structural changes observed was attributable to chromatid breakage. Probably protein decomposition was responsible for the production of the mutagenic substance or substances. The author suggests that the organic substances present in the soil through the activity of the microflora may play an important part in the origin of so-called spontaneous changes affecting genes and chromosomes. He also discusses the bearing of his observations upon the problems of crossing over and malignant growth. He regards the chemical induction of interchanges in somatic nuclei as involving a less specific process of pairing and crossing over than occurs in meiosis, when breakage may be regarded as taking place in a normal and synchronized manner.

3026 TREZZI, F. & BALIN, L.
Ricerche spettrofotometriche sull'azione della colchicina su estratti proteici "in vitro". (**Spectrophotometric researches on the action of colchicine on protein extracts *in vitro***).
RC Accad. Lincei 1956 : Ser. 8 : **20** : No. 1 : 59–71; also Lav. Ist. bot. Univ. Milano 1955 : **4** : No. 114.

Protein extracts of *Pisum sativum* 'Alaska' had the effect of reducing the absorption by a colchicine solution, root extracts being more effective than stem extracts. The effect was suppressed by the addition of reduced ascorbic acid. The results suggest that the colchicine molecules interact with the smaller protein molecules.

3027 MAURIZIO, A.
Pollengestaltung bei einigen polyploiden Kulturpflanzen. (**Pollen shape in some polyploid crop plants**).
Grana palynol. 1956 : **1** : No. 2 : 59–69.

The results of a morphological study of the pollen grains of diploid and tetraploid forms of 12 species, including *Datura* spp., *Nicotiana* spp., *Salvia* spp. and *Trifolium* spp., are presented. The doubling of the chromosome complement was associated with an increase of 15–29% in the equatorial diameter and polar axis and an increase of 62–109% in pollen volume. Changes in the length/breadth index were also observed in some species, in particular *Trifolium* spp. and *Salvia* spp. In all the species examined, tetraploid pollen grains had a larger number of pores than diploid pollen grains (cf. *PBA*, XXIII, Abst. 1661).

3028 RATTENBURY, J. A.
A rapid method for permanent aceto-carmine squash preparations.
Nature, Lond. 1956 : **177** : 1185–86.

The following technique is described as having several advantages over the usual methods of preserving squash preparations for chromosome studies. Freshly prepared squashes are thoroughly irrigated with 45% acetic acid to remove excess stain. A small drop of 10% glycerine in 45% acetic acid is then placed at the margin of the cover glass and allowed to flow under as evaporation takes place.

3029 VARZAT, B.
Contribution à l'étude caryologique des éléments reproducteurs et de la fécondation chez les végétaux angiospermes. (**Contribution to the caryological study of the reproductive elements and of fertilization in angiospermous plants**).
Rev. Cytol., Paris 1955 : **16** : 209–406.

A detailed account is presented of the size, shape, position and appearance of the cells and nuclei taking part in male and female sporogenesis and in fertilization in rye, barley, maize, sorghum, seven *Triticum* species, a wheat x rye amphidiploid, flax, pea, French bean and some ornamental plants.

3030 ERNST, A.
Untersuchungen zur Phänanalyse, zum Fertilitätsproblem und zur Genetik heterostyler Primeln. 4. Die F_2–F_5-Nachkommenschaften der F_1-Bastarde *Pr.* (*hortensis x viscosa*). Zweiter Teil. (**Investigations on phenotypic analysis, the fertility problem and the genetics of heterostylous primulas. 4. The F_2-F_5 progenies of *P. hortensis* x *P. viscosa* hydrids. Part II**).
Arch. Klaus-Stift. VererbForsch. 1955 : **30** : 147–262.

This article constitutes the second part of the paper summarized in Abst. 2009.

DISEASES, INJURIES, BACTERIA, FUNGI, VIRUSES

3031 HUGHES, W. H.
Bacterial variation to sensitivity: an example of individuality in micro-organisms.
Nature, Lond. 1956 : **177** : 1132–33.

By means of phase-contrast microscopy supplemented by time-lapse cinemicrography, differences in sensitivity to an antibiotic have been detected among the individual cells of single-cell cultures of bacteria (unspecified); the author briefly discusses the nature of the microbial clone.

3032 GARBER, E. D., SHAEFFER, S. G. & GOLDMAN, M.
The virulence of biochemical mutants of *Erwinia aroideae* for varieties of radish and turnip.
J. gen. Microbiol. 1956 : **14** : 261–67.

Thirty biochemical mutants of *E. aroideae* were tested for virulence on nine radish and three turnip varieties. The two arginine-requiring mutants were avirulent on all varieties of both species and four incompletely characterized mutants were avirulent or variable in pathogenicity on most varieties. Mutants requiring isoleucine and valine were markedly virulent on some varieties and avirulent on others. Most of the other mutants showed no loss of virulence.

3033 SKAAR, P. D.
A binary mutability system in *Escherichia coli.*
Proc. nat. Acad. Sci. USA 1956 : **42** : 245–49.

"The high rate of spontaneous mutation to streptomycin resistance (S^r) exhibited by the K-12 substrain CS19 has been shown to involve a binary mutability system. Mutations occur at or near the same *S* locus but their high frequency depends upon a remotely linked factor, *Mut*$^+$. The segregation of *Mut*$^+$/*Mut*$^-$ is well defined and is consistent with a close linkage of the *L* (leucine) locus."
[Author's summary].

3034 HELMKE, R.
Über die Sensibilisierung von *Bact. coli* B gegen die Bestrahlung mit kurzwelligem Ultraviolett der Wellenlänge 2537 Å durch Methylenblau. (**On the sensitivization of *B. coli* B to irradiation with short-wave ultraviolet rays of the wave length 2537 Å by methylene blue**).
Naturwissenschaften 1956 : **43** : 111–12.

When methylene blue was added to the culture medium prior to irradiation, 2·8 times as many mutants were obtained as when the cells were irradiated in the absence of this dye. The mutants were characterized by inhibition of the capacity to form colonies.

3035 JEYNES, M. H.
Nucleus and spindle of *Bacillus megaterium* in fission and sporulation.
Nature, Lond. 1956 : **177** : p. 849.

Critical of the view that mitosis occurs in *B. megaterium*, the writer gives reasons for regarding as unacceptable the suggestion made by Yuasa (cf. Abst. 2016) that the "side-body" may be equated with the spindle of the dividing yeast nucleus.

3036 WHITFIELD, J. F. & MURRAY, R. G. E.
The effects of the ionic environment on the chromatin structures of bacteria.
Canad. J. Microbiol. 1956 : 2 : 245–60.

Experiments on *Escherichia coli*, *Bacillus cereus* and other organisms indicated that the degree of aggregation of the chromatin depended largely upon the ionic environment and metabolic capability of the cell. It is suggested that chromatin aggregation is a function of the interaction of cations and negatively charged chromatin units.

3037 MINSAVAGE, E. J.
The nuclear cytology of *Salmonella typhosa*. I. The normal mitotic cycle. II. The effect of colchicine on the mitotic mechanism.
Diss. Abstr. 1955 : **15** : Publ. No. 11,423 : 674–75.

Elongation and contraction of the chromosomal bodies, of which there are at least three in the haploid state, were observed during the divisional cycle of *S. typhosa*. In populations treated with colchicine during the logarithmic growth phase, four distinct cell types were produced depending on the concentration of colchicine and the duration of treatment: (1) long cells in which the chromosomes appeared to have multiplied within the "nuclear membrane" so as to form axial nuclei; (2) large bodies or fusiform or Y-shaped cells containing either one dense nucleus or what are interpreted as polyploid nuclei; (3) round cells containing nuclear material; (4) cells containing one or two large, dense and apparently polyploid nuclei. These responses to colchicine are considered to be similar to those shown by higher organisms and are held to provide evidence of a mitotic mechanism in *S. typhosa*.

3038 TOMIZAWA, J. & SUNAKAWA, S.
The effect of chloramphenicol on deoxyribonucleic acid synthesis and the development of resistance to ultraviolet irradiation in *E. coli* infected with bacteriophage T2.
J. gen. Physiol. 1956 : **39** : 553–65.

Experiments in which chloramphenicol was used as an inhibitor of protein synthesis indicated that, in infected *Escherichia coli*, protein synthesis is prerequisite to the initiation of DNA synthesis but is not essential for its continuation. The development of resistance to ultraviolet radiation (UV) was prevented by chloramphenicol, even when the antibiotic was added at times sufficiently late to permit continued synthesis of DNA. Thus the development of UV resistance appears to depend upon protein synthesis and to parallel the rate of DNA synthesis rather than the amount of DNA accumulated. According to this interpretation, the new DNA formed is not the radiation-sensitive target in the infected bacterium. The possibility that genetic specificity introduced by the DNA of the infecting phage is transferred to protein before DNA synthesis can be initiated requires consideration.

3039 NORTHROP, J. H. & MURPHY, J. S.
Appearance of new phage types and new lysogenic strains after adaptation of lysogenic *B. megatherium* to ammonium sulfate culture medium.
J. gen. Physiol. 1956 : **39** : 607–24.

Gradual adaptation of lysogenic *Bacillus megaterium* to a minimal medium containing ammonium sulphate resulted in the appearance of new fast-growing colony types which produced many new phage types. Upon culture in peptone the growing rate of the adapted strains returned to its initial value and the ability to grow rapidly in the medium containing ammonium sulphate was soon lost. None of the colony types was stable upon repeated transfer in peptone or the medium containing ammonium sulphate but continued to dissociate into different colony types. The phage types remained stable, however, irrespective of the medium. No evidence was obtained that adaptation and the occurrence of new colony types were associated with phage infection of sensitive cells. The phage types are regarded as having their origin in the genetic constitution of the host cells. It is postulated that in general the ability to produce phage is a genetic character of the bacterial cell, the phage being a metabolic product. Observations made by other investigators in support of this view are listed.

3040 MORSE, M. L., LEDERBERG, E. M. & LEDERBERG, J.
Transduction in *Escherichia coli* K-12.
Genetics 1956 : **41** : 142–56.

"Transduction of several *Gal*$^+$ genes from galactose positive (*Gal*$^+$) to galactose negative cells (*Gal*$^-$) by the bacteriophage lambda has been demonstrated. The resultant galactose positive clones have been found to be heterozygous for the *Gal* region and have been designated as heterogenotes (*Gal*$^-$/*Gal*$^+$). Segregation and the reappearance of *Gal*$^-$ from the heterogenotes occurs about once per 10^3 bacterial divisions. The low frequency of lambda particles with *Gal* genes ($1/10^6$) from haploid cultures resembles other transduction systems. However, heterogenotic cultures produce lysates in which nearly every lambda carries *Gal* genes. No other markers have been transducted by lambda, and the competence of lambda in transduction depends upon its production from lysogenic cells, rather than by lytic growth on sensitive bacteria."

[Authors' summary].

3041 KENNEDY, M. E. & BURNETT, J. H.
Amphithallism in fungi.
Nature, Lond. 1956 : **177** : 882–83.

The authors describe four types of cytological behaviour resulting in amphithallism, i.e. the production of spores homocaryotic and heterocaryotic for mating type by a single fruit body.

3042 MITCHELL, M. B. & MITCHELL, H. K.
Tests for non-allelism at the pyrimidine-3 locus of Neurospora.
Genetics 1956 : **41** : 319–26.

Investigations were carried out to elucidate the relationships of the pyrimidine-requiring mutants *pyr-3a*, *pyr-3b* and *pyr-3d*, respectively referred to below as *a*, *b* and *d* (cf. *PBA*, XXIII, Abst. 135). Mutants *a* and *d* are phenotypically similar but differ from *b* which only shows its requirement for pyrimidine above 31° C. A suppressor acts upon both *a* and *b* but not upon *d*. In heterocaryons, the combinations $a + d$ and $b + d$ were pyrimidine independent, whereas $a + b$ showed a partial requirement for pyrimidine. Crosses of *a*, *b* and *d* with the wild type were fertile, as were also *b* x *b* and *a* x *b*; *a* x *a* and *d* x *d* were completely sterile while *a* x *d* and *b* x *d* were almost sterile. No wild-type progeny have been obtained from *a* x *b* but both *a* x *d* and *b* x *d* give occasional wild types. It has not been demonstrated that the wild types arise as the result of crossing over. The behaviour of the three mutants is considered to be consistent with the possibility that they represent different mutations at the same locus. It is suggested that the wild types from *a* x *d* and *b* x *d* are the result of reverse mutation occurring in *d* in association with a nearby cross over.

3043 BOONE, D. M., STAUFFER, J. F., STAHMANN, M. A. & KEITT, G. W.
***Venturia inaequalis* (Cke.) Wint. VII. Induction of mutants for studies on genetics, nutrition, and pathogenicity.**
Amer. J. Bot. 1956 : **43** : 199–204.

Morphological colour and biochemical mutants of *V. inaequalis* induced by nitrogen mustard and ultraviolet radiation are classified.

3044 Boone, D. M. & Keitt, G. W.
Venturia inaequalis (Cke.) Wint. VIII. Inheritance of color mutant characters.
Amer. J. Bot. 1956 : **43** : 226–33.

Ten out of twelve colour mutants induced by nitrogen mustard behaved as if dependent upon single genes (cf. Abst. 3043). Five of these mutations also conditioned abnormal development of the ascospores. The following linkage groups were established: I, centromere, *br* (brown), *wh*-2 (white-2), *pa* (pale); II, centromere, *ye*-2 (yellow-2), *pi* (pink), *gr* (green); and III, centromere, *ye*-1 (yellow-1).

3045 St. Lawrence, P.
The *q* locus of *Neurospora crassa.*
Proc. nat. Acad. Sci. USA 1956 : **42** : 189–94.

A detailed account is given of investigations already referred to in Abst. 944.

3046 Pittenger, T. H. & Atwood, K. C.
Stability of nuclear proportions during growth of Neurospora heterokaryons.
Genetics 1956 : **41** : 227–41.

Experiments on heterocaryons derived from homocaryotic stocks for *pan al*-1 *nic*-2 *al*-2 *lys*-3 and *arg*-6 provided evidence that the nuclear proportions in heterocaryons possessing a wide range of nuclear ratios remain stable under diverse conditions, even when a change in nuclear proportions would be of adaptive value (cf. *PBA*, XXV, Abst. 2788 and XXVI, Abst. 954).

3047 El-Ani, A. S.
Cytogenetics of sex of *Gibberella cyanogena* (Desm.) Sacc.
Science 1956 : **123** : p. 850.

A variant of *G. cyanogena* characterized by maleness instead of hermaphroditism was the result not of chromosome loss but of a single-gene mutation.

3048 Wheeler, H. E.
Sexual versus asexual reproduction in Glomerella.
Mycologia 1956 : **48** : 349–53.

The results of experiments to elucidate the effects of A^+ and A^1 for perithecial and conidial cultures respectively supported the hypothesis that genes affecting the mode of reproduction do so by controlling the synthesis of chemical substances (cf. *PBA*, XXV, Abst. 84).

3049 Smuljskaja, O. P.
(The effect of yeast strain upon the sparkling properties of champagne).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1955 : No. **8** : 19–23. [Russian].

Data on the sparkling properties of champagne fermented by Kahuri 7, Sudak 5–VI and Feodosija 2–IX strains at Odessa are presented. Sudak 5–VI, a new strain from the Magarač Institute, and Kahuri 7 proved superior to Feodosija 2–IX, another recent selection from Magarač.

3050 Hawthorne, D. C.
Chromosome mapping in Saccharomyces.
Diss. Abstr. 1955 : **15** : Publ. 14,250 : p. 1984. (Abst.)

Of 45 genes studied, 21 have been mapped on seven different chromosomes and three others were shown to be linked but could not be assigned to a particular chromosome. Linear asci have been used in determining the linkage of 35 genes to the centromere and a method based on tetrad analysis has been developed for calculating map distances between loci which are only moderately linked.

3051 Saraswathy Royan, & Subramaniam, M. K.
The nucleus in the living yeast.
Proc. Indian Acad. Sci. : Sect. B. : 1956 : **43** : 228–32.

According to the authors' examination of living cells of *Saccharomyces cerevisiae* by means of ordinary, phase-contrast and dark-ground illumination, the nucleus and vacuole each possess a membrane delimiting it from the cytoplasm. They therefore suggest that possibly yeast is a binucleate organism.

3052 Saraswathy Royan, & Bhattacharya, D. L.
Some cytoplasmic details of yeast revealed by the electron microscope
Curr. Sci. 1956 : **25** : 155–56.

Hydrolysis of yeast cells rendered the cytoplasm transparent when examined by the electron microscope; an opaque body resembling the nucleus in stained preparations was observed.

3053 Mortimer, R. K.
Evidence of two types of X-ray-induced lethal damage in *Saccharomyces cerevisiae.*
Radiation Res. 1955 : **2** : 361–68.

Damage of the recessive lethal and dominant lethal types was induced in haploid cells in a ratio of approximately 15 : 1. Killing is thought to be chiefly of the dominant lethal type in X-irradiated $2n$, $3n$ and $4n$ cells.

3054 Owen, M. E. & Mortimer, R. K.
Dominant lethality induced by X-rays in haploid and diploid *Saccharomyces cerevisiae.*
Nature, Lond. 1956 : **177** : 625–26.

The frequency of induced dominant lethal damage was considerably greater in the diploid cells than the haploid. No conclusion concerning the nature of the damage could be reached.

3055 Lindegren, C. C.
Methods for the diagnosis of gene-controlled fermentative ability in *Saccharomyces.*
Wallerstein Labs. Commun. 1956 : **19** : No. 64 : 49–62.

"A new, rapid micromethod for diagnosing aerobic fermentative ability has been developed. In this procedure, a melting point tube is partially filled with yeast suspension, nutrient medium, and the sugar which is to be tested. The tube is then sealed at one end in an oxygen flame. An adequate air space is left to permit adaptation. The sealed tube is mounted horizontally in a piece of cellulose fiber acoustic tile. The concentration of sugar used is sufficient to fill the tube with CO_2 after the adaptation has occurred. The CO_2 causes the fluid to move toward the open end where it forms a small drop which, upon drying, leaves a deposit of yeast and other materials at the end of the empty tube. Glucose is fermented in a few minutes; sugars which require adaptation are fermented later. This micro-method is more effective for this purpose than either the Durham tube or the syringe gasometer."

"A method for testing anaerobic fermentation using the Smith tube filled with mercury is also described."

[From author's summary].

3056 Levi, J. D.
Mating reaction in yeast.
Nature, Lond. 1956 : **177** : 753–54.

Evidence has been obtained from cultures on malt-agar films suggesting that mating between α and *a* types in *Saccharomyces cerevisiae* is hormone-controlled.

3057 Laskowski, W.
The genetics of resistance of *Saccharomyces* to lithium chloride.
Genetics 1956 : **41** : 98–106.

Strains differing in degree of resistance to LiCl have been isolated. Mutants resistant to concentrations of 0·5 N and 1·0 N were obtained by treatment with these concentrations. Five dominant genes for resistance were identified, L_V, L_W, L_X, L_Y and L_Z with noncumulative effects. Resistance to LiCl was not associated with increased resistance to other salts.

3058 Buxton, E. W.
Genetics of pathogenicity in *Fusarium oxysporum.*
Biochem. J. 1956 : **63** : p. 30P. (Abst.)

Mutants of *F. oxysporum* f. *pisi* avirulent to pea formed heterocaryons in which virulence was restored to the same degree as that possessed by the original pathogenic wild-type isolates. When heterocaryons were produced between nutritional mutants derived from pathogenic races 1 and 2, some prototrophic conidia were obtained. Recombinants among the progenies of the prototrophic colonies were tested for their pathogenicity on differential pea varieties. Some caused wilt in a variety resistant to races 1 and 2, thus resembling race 3 (cf. Abst. 1919). It is therefore suggested that such a process of recombination, which resembles the parasexual recombination reported in *Aspergillus* and *Penicillium* by Pontecorvo *et al.*, and the effect of heterocaryosis upon virulence, may account for a considerable amount of the variability in the pathogenicity of this fungus and other fungi imperfecti.

3059 Stahl, F. W.
The effects of the decay of incorporated radioactive phosphorus on the genome of bacteriophage T4.
Virology 1956 : **2** : 206–34.

Study of the progeny of mixed infections of *Escherichia coli* with P^{32}-inactivated wild-type phage and marked viable phage has provided evidence that the damage caused by incorporation of P^{32} in the deoxyribonucleic acid (DNA) of the phage is genetically localized. It is suggested that the genome of a phage particle undergoes fragmentation corresponding to the fragmentation of DNA by P^{32} decay and that markers on a fragment with the wild type are reactivated if the fragment is incorporated into a genome during the formation of a daughter replica belonging to the viable population. Reactivation usually takes place in the first few generations of growth of the vegetative phage whereas recombination between undamaged phage particles occurs primarily in later generations.

CROP PLANTS

3060 **Report of the Agricultural Department, University College, Dublin, for the year 1954–55.**
24th Ann. Rep. Minist. agric. 1954–55 : Appendices. Pp. [1]–[18].

Wheat. Glasnevin Rosa, hitherto resistant to yellow rust, became badly infected in 1954, probably as the result of the occurrence of a new race of the pathogen. Lines from Hybrid 46 x (Glasnevin Rosa x Kärn [Kernel]) were highly resistant to the putative new race. Hybrids from Glasnevin Rosa x Kärn were superior to Atson and Svenno in a randomized-block experiment. It is however expected that stronger straw and a higher degree of resistance to yellow rust will be found among derivatives of crosses involving Koga, Peko and other varieties.
Oats. From Glasnevin Triumph x Bonstar, Glasnevin Triumph x Pendek and other crosses, it is hoped to obtain types with shorter straw than Glasnevin Triumph, the variety giving the best performance in the Irish Republic on soils ranging from average to rich fertility.
Barley. The commercial varieties Glasnevin 1, 2 and 5 have been developed from crosses of European barleys with Spratt-Archer 37 No. 3. They are lodging resistant, early ripening and high yielding.
Grasses. Two strains of cocksfoot have been bred, one of which is characterized by earliness of spring growth and winter greenness. The development of an early timothy strain for hay and a perennial ryegrass strain based on plants from a century-old pasture is in progress. Meadow-fescue and red-clover breeding continued.
Apple. Some seedlings from Cox's Orange Pippin x Allington Pippin have inherited the mildew susceptibility of their Cox parent.
Brussels sprouts. The development of a good market sprout is almost complete. The new variety is expected to supersede Glasnevin Supreme. Progress has been achieved in breeding strains for freezing.
Tomato. Breeding for resistance to *Cladosporium* leaf-mould continued.

Forty-sixth Annual Report of the John Innes Horticultural Institution 1955 (1956) : Pp. 36.

3061 *Williams W. Department of plant breeding. (pp. 6–13).*

Apple. Breeding for scab and mildew resistance is being initiated, the chief lines of approach being the use of known resistance genes from wild *Malus* species and the identification of new sources of resistance in the Bayfordbury collection of cultivated varieties.
Work on the induction of mutation in apple and pear by means of P^{32} has begun.
Pear. The midseason selections 709 (Margaret Marrillat x Conference), 3362 (Comice x Beurré Giffard) and 4016 (Glou Morceau x Williams $4x$) have shown promise. Microsporogenesis in the diploid variety Beurré Bedford is abnormal, male gametes with x, $2x$, $3x$ or $4x$ chromosomes being produced. When this variety is used as pollen parent in crosses with diploids and tetraploids, haploid pollen usually fertilizes diploid female parents and diploid pollen tetraploids, giving $2x$ and $4x$ progeny respectively. Beurré Bedford behaved as a normal diploid when used as female parent, indicating that meiosis is normal on the female side.
Cherry. During selection for quantitative economic characters in cultivated varieties of sweet cherry, the three loci for incompatibility, albinism and pigmentation of the fruit juice, respectively, although expected to be neutral to selection, have all shown a selective advantage in the heterozygous condition (cf. Abst. 2773).
Peach. Each of four major gene loci surveyed in 500 varieties showed varying allelic frequencies according to the physiological characteristics of the varieties. It is suggested that secondary pleiotropic effects are the most likely reason for the absence of neutrality to selection in major genes of this kind.
Rubus. Nineteen of the 102 blackberry seedlings surviving out of a total of 480 obtained by selfing Merton Thornless have been selected on the basis of vigour, earliness of flowering, size of the inflorescence and fruit volume. Of 400 thornless second-year plants derived from selfed John Innes, only three have flowered; the family shows very low winter mortality. The progeny of the cross John Innes x Merton Thornless gave a ratio of 132 thorny : 26 thornless in agreement with the 5 : 1 ratio expected for a duplex x multiplex cross. Vigour seemed to be independent of the presence or absence of thorns.

A comprehensive collection of *Rubus* species is being established and determinations of the chromosome numbers of each sample are being made. Reciprocal crosses between six diploid species show considerable cross and self incompatibility even when pollen production appears normal. The Chinese species *R. lasiostylus* gave successful crosses only when used as female parent and only with the male parents *R. tomentosus* and *R. coreanus*. *R. tomentosus* is self compatible and is highly fertile as female parent with all the diploid species with which it was crossed. In studies of reproductive mechanisms in apomicts, hybridization failed in the cross *R. calvatus* 'Edward Langley' x *R. nitidioides* 'Merton Early' because of apospory, while *R. laciniatus*, which reproduces apogamously, produced a few hybrids when crossed with *R. nitidioides*. *R. procerus* 'Himalaya Giant' pollinated by *R. nitidioides* produced some true and some doubtful hybrids, the hybrids being generally weaker than the matroclinous sibs. The progeny of selfed *R. procerus* all showed matrocliny.

Albinotic, pleiocotylous and variegated seedlings have appeared in several of thirty collections of *R. idaeus*. The chromosome number in each population is $2n = 14$.

Strawberry. Eight selections from the 1950 crosses have maintained their earlier promise and are undergoing final testing. The seedling JI547 (Royal Sovereign x 31) has been named Merton Princess; it gives high yields and is resistant to mildew. Of four stocks of *Fragaria chiloensis*, one has proved to be resistant to *Phytophthora fragariae* and two further sources of resistance have been found among 39 varieties and seedlings of garden strawberry.

3062 *Lewis, D. Department of genetics. (pp. 14–17).*

Unilateral incompatibility between species

Observations on pollen tube growth in crosses between self compatible and self incompatible species were made in (1) interspecific *Antirrhinum* crosses, (2) crosses among seven Solanaceous genera and (3) crosses of the same Solanaceous species with *Antirrhinum* species. In each case it was found that the pollen of species in which self compatibility has been long established was inhibited from growing in the styles of self incompatible species while that of species with self compatibility of more recent origin was able to grow. It is concluded that incompatibility in the species of the two families has a common origin and a similar, perhaps identical, genetical and physiological basis. The study of pollen tube inhibition may be of value in assessing phylogenetic relationships. It is suggested that compatibility may become established by the following sequence of events: a switch gene mutates to give a self-compatible allele which allows the pollen to grow in self-incompatible styles; self compatibility then becomes established and the genetic outbreeding system is lost, leaving the pollen with a nonspecific reaction so that it becomes inhibited in incompatible styles.

Coprinus lagopus. When grown on a solid medium, half of the haplophase isolates from a single fruiting body gave a positive reaction to the Nadi test for cytochrome oxidase activity and half gave a negative reaction. Spectroscopic analysis showed that the two types of culture differed in the total concentration and relative proportions of the three cytochromes a, b and c. The difference between the two forms appears to depend on more than one gene and upon cytoplasmic factors.

Cherry. Progenies from crosses of the types S_1S_2 x S_1S_F and S_1S_2 x S_3S_F have fruited and, as predicted, all trees from the first cross and half of those from the second are self compatible.

Brassica. In a trial of eleven hybrids and the progenies from their sib-mated and selfed parents, the cabbage hybrids Red Drumhead x Greyhound and Red Drumhead x January King and the hybrids Dwarf Green Curled kale x January King and January King x marrow stem kale surpassed the controls. The selfed progenies gave lower total yields than the sib crosses. Work on the production of inbred lines to give more uniform F_1 families is continuing.

3063 *La Cour, L. F. Department of cytology. (pp. 18–21).*

Chromosome breakage

In crosses of *Paris quadrifolia* ($2n = 20$) with *Trillium cernuum* ($2n = 10$) and *T. grandiflorum* ($2n = 10$), hybrid endosperms from *Paris* ♀ x *Trillium* ♂ showed spontaneous chromosome breakage about twenty times more frequently than those from the reciprocal crosses; the breakages occurred in both euchromatic and heterochromatic regions.

Chromatin

Euchromatin and heterochromatin derived from root and ovary wall tissue of *Fritillaria falcata* gave similar ultraviolet absorption curves with the peak absorption at 275 mμ, but the difference between the maximal extinction and extinction at 313 mμ was only 0·24 for euchromatin while for heterochromatin it was 0·53. Both curves were typical of a tyrosine-containing protein with no evidence of tryptophane. In pollen grains stained with orange G and aniline blue, staining behaviour from interphase to the formation of two daughter nuclei was as expected (cf. *PBA*, XXV, Abst. 2811). Thereafter the future vegetative nucleus, which at first stains yellow, expands and stains blue and its nucleoli stain yellow; the generative nucleus enters first a short interphase period during which it stains blue and then a prophase condition in which it stains yellow. Further investigations into the nature of the phospholipid complex involved are in progress.

Radiation sensitivity

In root tips of *Vicia faba*, chromosome breakages following X irradiation were significantly fewer in cells containing extra nucleolar organizers, but the protective effect was apparent only during a 10-hour period in the mitotic cycle, ending 4 hours before metaphase. From observations on DNA synthesis it is inferred that the period of low breakage begins after the completion of DNA synthesis and ends just before the beginning of prophase.

B Chromosomes

B chromosomes in *Ranunculus ficaria* have been found only in diploids from southern England and the Midlands and are of three distinct types.

Chiasma formation

Sensitivity of *Tradescantia* to infrared irradiation at 20° C., resulting in increased interstitial chiasma formation, occurs during a six-hour period ending 18 hours before metaphase I of meiosis. In *T. bracteata*, the formation of interstitial chiasmata is induced only after a threshold number of terminal chiasmata has been formed.

Biological problems encountered in crop improvement schemes.
Agric. Progr. 1954 : **29** : No. 2 : 121–28.

3064 *Elliott, C. S. General aspects of crop testing technique and recent results.* (*pp. 121–24*).

Varietal testing procedure as carried out by the National Institute of Agricultural Botany in conjunction with the National Agricultural Advisory Service is outlined with particular reference to cereal testing. In addition to field trials, specific tests for resistance to pests and diseases, suitability for spring sowing, shattering resistance and other characteristics depending on the crop, are performed.

3065 *Batts, C. C. V. Developments in testing for resistance to disease.* (*pp. 125–28*).

Since the Mycology Department at the National Institute of Agricultural Botany, Cambridge, was inaugurated, it has been concerned chiefly with testing the reactions of wheats to *Puccinia glumarum* and of wheat and barley varieties to *Ustilago nuda*. The inoculation techniques used are indicated.

Problems encountered include the inconsistent reactions of barley varieties and the presence of mycelium in the grains of some smut-resistant wheats, growing plants of which nevertheless appear to be uninfected.

Work on other crops and diseases is also in progress.

(**Scientific reports of the USSR Lysenko Institute of Breeding and Genetics**). 1949 : Pp. 246. [Russian].

3066 *Kiričenko, F. G.* (*Breeding and seed growing of winter wheat*). (*pp. 5–43*).

This report on the work carried out at Odessa till 1946 deals, among other things, with hybridization between hard and soft wheats. Other topics include intervarietal hybridization, the use of open pollination and the relation between hardiness and the depth of formation of nodes in winter wheats. The substance of these latter sections of the report is incorporated in the articles summarized in *PBA*, IX, Abst. 244 and XXII, Abst. 2605.

3067 *Šumakova, E. M. & Kiričenko, F. G.* (*Breeding and seed growing of spring wheat*). (*pp. 44–66*).

An account of intervarietal and interspecific hybridization, in the years immediately after the Second World War, together with general descriptions of the F_1 and F_2 hybrids, is presented. Lysenko's method of training the hybrid progenies for the spring habit proved effective.

3068 *Garkavyĭ, P. F.* (*The breeding of spring barley*). (*pp. 68–142*).

This report for the period 1936–1946 describes the varieties Odessa 14, Odessa 18 and Odessa 19, besides Odessa 9 referred to in *PBA*, XIX, Abst. 290. Odessa 14 (Medicum 46 x Pallidum 330/11) was obtained by crossing forms selected on the basis of their developmental phases. It has large grain and surpasses the standard Pallidum 32 in yield and resistance to covered smut. Odessa 17 was selected from Odessa 9 which it outyields by 1·1 c. per ha. Odessa 19, a selection of Odessa 14, is notable for a high degree of resistance to lodging. It has larger grain than Odessa 14 and is more productive.

3069 *Musiĭko, A. S.* (*Research on cross-pollinating plants*). (*pp. 143–61*).

Evidence that supplementary pollination increases the yield of buckwheat, rye, maize, lucerne and sunflower is presented.

3070 *Vengrenovskiĭ, S. I. & Sokolenko, N. F* (*Research on forage plants*). (*pp.* 162–82)

Breeding work on *Sorghum*, Sudan grass, *Agropyron cristatum* and lucerne is described. It involved interspecific hybridization and the use of open pollination, sowing at unaccustomed dates and other Lysenko methods. The achievements include new varieties of Sudan grass, described in *PBA*, XX, Abst. 337.

3071 *Oljšanskiĭ, M. A.* (*Producing the cotton variety Odessa 1*). (*pp. 183–96*).
This account of breeding work on cottons in the pre-war years mentions Odessa 1 (Pioner 915 [Pioneer 915] x Šreder 1306), characterized by resistance to gummosis, greater earliness than the standard Šreder 1306 and other valuable characteristics.

3072 *Hitrinskiĭ, V. F.* (*Directed changing of inheritance in plants by training as a breeding method*). (*pp. 197–220*).
Experiments on training winter cereals for the spring and spring cereals for the winter habit, carried out during the period 1935 to 1946, are reported and descriptions of altered forms of wheat and barley thus obtained are given.

3073 *Šimanskiĭ, N. K.* (*Changing the spring wheat Erythrospermum 1160 into a winter wheat*). (*pp. 221–31*).
The substance of the report was summarized in *PBA*, XI, Abst. 672.

3074 *Hazina, E. P.* (*Vegetative hybridization of the tomato*). (*pp. 232–46*).
Experiments on vegetative hybridization of the tomato, sometimes as in the case of Humbert/nightshade involving interspecific grafts, are reported. The resulting changes in morphological and economic characters of the seed progenies are described.

(**Scientific reports of the USSR Lysenko Institute of Breeding and Genetics**). 1952 : Pp. 160. [Russian].

3075 *Oljšanskiĭ, M. A.* (*The theoretical principles of the method of intervarietal open hybridization in plants*). (*pp. 34–51*).
The substance of this report was summarized in the *PBA*, XXIII, Abst. 1063.

3076 *Kiričenko, F. G.* (*Intervarietal hybridization of winter wheat*). (*pp. 52–64*).
The substance of the article was summarized in *PBA*, XXII, Abst. 2605.

3077 *Musiĭko, A. S.* (*Intervarietal hybridization of maize*). (*pp. 65–77*).
This report is substantially the same as that summarized in *PBA*, XXII, Abst. 1141.

3078 *Musiĭko, A. S.* (*Intervarietal hybridization of winter rye*). (*pp. 78–80*).
Two new varieties Odesskaja Gibridnaja 1 [Odessa hybrid 1] and Odesskaja Gibridnaja 2, both more productive than the standards Veselyĭ-Podol and Taraščanskaja 2, are reported from Odessa. They were both obtained by open pollination involving Veselyĭ Podol as the seed parent. Harjkov 194, Taraščanskaja 2 and Taraščanskaja 4 supplied the pollen for the first cross and a number of Moldavian land varieties for the second.

3079 *Šimanskiĭ, N. K.* (*Intervarietal hybridization of the sunflower*). (*pp. 81–89*).
The substance of this article was summarized in *PBA*, XXII, Abst. 1360.

3080 *Oljšanskiĭ, M. A. & Gubenko, I. H.* (*Intervarietal hybridization of cotton*). (*pp.* 90–95).
Intervarietal hybridization involving Odessa 1, which in the 1950 trials outyielded all other varieties and was especially productive of raw cotton before the onset of frosts, is reported. Data are provided on the yield, maturation, boll weight, length of fibre and ginning percentage of Odessa 3 (Odessa 1 x 3677), Odessa 4 (Odessa 1 x S15), Odessa 5 (Odessa 1 x S3173) and Odessa 6 (a hybrid population derived from Odessa 3, Odessa 4 and Odessa 5). All the above varieties outyielded the standards 611b, S3210 and S3173, the most productive among them being Odessa 3 and Odessa 6. Work on the development of a new high-yielding population involving Odessa 1–5, 611b, S3210, D18, 3521, 8802 and many other varieties is mentioned.

3081 *Hitrinskiĭ, V. F.* (*Controlled change of the inheritance of plants*). (*pp. 96–114*).
Experiments on directing changes in cereals by sowing at an unaccustomed date have been continued (cf. Abst. 3072). This report deals with conversion of hard spring wheats and of *Triticum turgidum* into *T. vulgare* and also with controlled conversion of a spring rye into winter rye and with the improvement of the seed types in spring wheats obtained by sowing them as winter cereals for a generation. The sections on rye and improvement of the seed quality are substantially the same as the summarized accounts in *PBA*, XX, Abst. 2275 and XXI, Abst. 2551.

3082 *Hazina, E. P.* (*The role of vegetative hybridization in breeding work*). (*pp. 115–25*).
The account of experiments on tomatoes referred to in *PBA*, XXII, Abst. 1530 has been extended to include observations on the first, second and third seed generations of the vegetative hybrid of a pungent *Capsicum*

variety/sweet *Capsicum* variety. Data showing variability in fruit shape and colour and capsaicin content among the third generation plants are presented.

3083 *Favorov, A. M. & Petrova, L. L. (Breeding and seed growing of horticultural plants). (pp. 126–37).*
This article, dealing mainly with Mičurinist methods of intravarietal pollination, mentions the tomatoes Odessa 19 (Čudo Rynka [Market Wonder] x Break o' Day) and Odessa 71 (Odessa 19 x Break o' Day), the former distinguished by a high solids content and the other by high yield, large fruit and fine flavour. Reference is made to work on reintroduction of the cabbage variety Kaporka Odesskaja [Odessa Caper], lost during the war. It is characterized by high yield, resistance to pests and tolerance of salinity.

3084 *Kiričenko, F. G. (Accelerated multiplication of the winter wheat varieties Odessa* 3 *and Odessa* 12 *and the development of new varieties). (pp. 138–46).*
The area under Odessa 3 and Odessa 12, which are notable among Ukrainian wheats for their hardiness and drought resistance, was rapidly expanded each year from 1946 onwards to 1950. Recent achievements in breeding wheats include the new varieties Odessa 16 (a selection of Odessa 12) and 121/47 (Odessa 12 x Vorošilovskaja). A full description of Odessa 16 was given in *PBA*, XXVI, Abst. 1181. The other variety outyields Odessa 3 by 2–3·8 c. per ha. and is winter hardy and drought resistant.

3085 *Vengrenovskiĭ, S. I. & Sokolenko, N. F. (A safe method of obtaining high yields and improving the racial quality of lucerne seed). (pp. 147–55).*
An extended account of the report summarized in *PBA*, XXII, Abst. 1212 is given.

3086 Kuzjmin, V. P.
(The methods and results of breeding field crops for the steppe zone of the northern Caucasus).
Agrobiologija (Agrobiology) 1956 : No. 1 : 40–46. [Russian].
The Mičurinist basis of breeding drought-resistant varieties of wheat at Šortandy is discussed. Among the achievements are the hard wheat selections Akmolinka 2 and Akmolinka 5, which outyield the standard Hordeiforme 189 by 20–25%, and the newly bred soft spring wheats Pestruška [Variegated], Milturum 450, Akmolinka 6/1 and Lutescens 383/11. These are superior in baking quality to previously bred varieties, which they also surpass in resistance to drought and scorching. The following new varieties of other plants are mentioned. The winter rye variety Zima [Winter] was obtained by open pollination involving hardy Siberian material and varieties from Scandinavia and the Baltic republics. It is characterized by high yields, large grain, good baking quality and hardiness. The lucerne variety Šortandy 2 was selected among open-pollinated progenies of Tibetan and is notable for earliness, hardiness and resistance to drought. New oil plants include the sunflower Šortandy 41 and the *Camelina* variety Šortandy; both combine earliness, productivity and improved oil content. Two potato varieties were obtained by selection from Polevka [Field] and Stepnaja Roza [Steppe Rose]; others were bred from unspecified material. All these are distinguished by high tuber yield, earliness, and resistance to drought and diseases. Bogarnyĭ [Rain-fed] and Buljba are wart-resistant.

3087 Badovskiĭ, P. I.
(From the plot on to the field of a collective farm).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 2 : 34–37. [Russian].
Among the achievements in breeding field crops on a farm in the Stavropolj province, mention is made of the new wheat Novoukrainka Gibridnaja [Hybrid Novoukrainka]. It was obtained by open pollinating Novoukrainka 83 with Kubanj 128 and Krasnodar 622/2 and is notable for large grain, high yield and resistance to drought and *Puccinia*. The new *Panicum* millet variety Kapeljnoe [Drops] (Gibrid Lysova [Lysov's Hybrid] x Veselyĭ Podol 367) has large panicles and grain and shows resistance to shedding, lodging and diseases. It outyields Veselyĭ Podol 367 by 7–8 c. per ha. Mention is made of two early potato varieties obtained by selection of local material or of Severnaja Roza [Northern Rose] from Gorjkiĭ.

3088 Sidorov, I. & Kabanov, P.
(At the Institute of Agriculture for the South-east).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 3 : 40–42. [Russian].
Mention is made of breeding work on cereals and oil plants and a number of drought-resistant varieties bred in recent years are listed. The new spring wheats include the hard wheat Jugo-vostočnaja 9 [South-eastern 9] which outyields Hordeiforme 432 by 4 c. per ha. under rainfed conditions. Another hard-wheat selection,

Jugovostočnaja 144, is suitable for cultivation on irrigated land.

3089 MORK, R.
Årsberetning fra Norges Landbrukshøgskole for budsjettårene 1. Juli 1950–30. Juni 1953. (**Annual report of the Norwegian Agricultural College for the fiscal years 1 July 1950–30 June 1953**) 1956 : Pp. 192.

Institute of Plant Culture

Cereals. The breeding of wheat varieties resistant to loose smut and immune from attack by the new mildew races which attack the previously immune varieties is in progress. Barley is being bred for resistance to the same two diseases and in oats the main breeding objective is crown-rust resistance. In cooperation with the Institute of Genetics and Plant Breeding, research on mutation breeding in oats has been initiated. Attempts to obtain wheats and barleys resistant to foot-rot diseases are being made. Other investigations include research on selection methods and on intervarietal differences in rate of assimilation.

Grasses. Tests of Norwegian local races and introduced varieties of timothy and other grasses have been carried out.

Root crops. Turnips are being subjected to crossing and selection and beets, swedes and turnips are undergoing trial.

Potato. Crosses with other *Solanum* species have been effected with the aim of obtaining varieties with improved resistance to virus X, dry rot and other diseases and to frost damage.

Institute of Forest Management

Provenance trials of Norwegian firs and German and other central European spruces have been established. Trials of coniferous species introduced from North America are also in progress. Pollen dispersal is being studied with a view to determining the necessary isolation distances for seed plantations. Crossing between *Populus tremula* and *P. tremuloides* is under way.

3090 THØGERSEN, O.
Beretning om landboforeningernes virksomhed for planteavlen på Sjælland 1955. (**Report on the agricultural associations' work on plant cultivation in Sjælland, 1955**).
København 1956 : Pp. 239.

Details are given of field experiments, including varietal trials of wheat, oats, rye, barley, white clover, root crops and potatoes, carried out at numerous localities in Sjælland, Denmark.

3091 Lijst van proeven en proefbedrijven van rijkslandbouwconsulenten en andere instanties 1956. (**List of tests and experimental farms of national agricultural advisers and other authorities, 1956**).
Meded. LandVoorlDienst, Den Haag 1956 : No. 72 : Pp. 123.

In addition to listing experimental farms and national agricultural consultants in the Netherlands, this report, which is issued by the Central Institute for Agricultural Research, Wageningen, outlines field experiments proposed for 1956 and gives a list of new varieties of forage grasses, cereals, rape, peas, beans, flax, linseed, poppy and potato not included in the Thirtieth descriptive list of agricultural crop plants (cf. *PBA*, XXV, p. 635).

3092 VARENICA, E. T.
(**Progress in agricultural science in Yugoslavia**).
Zemledelie (Agriculture) 1956 : No. 3 : 109–20. [Russian].

Wheat. The new winter varieties 905/8 (Bánkút x Marquis) and 908/12 were bred at Zemun. The former shows resistance to rust, the other is characterized by great earliness and short firm straw. At Zagreb breeding wheats for resistance to rust and lodging involves distant hybridization between local Croatian forms and introduced varieties from the USA, Canada, Italy and Africa. Among the varieties bred are Ueden, a hybrid between a Yugoslav and an Italian variety, and Maksimirskiĭ Prolifik [Maksimir Prolific], a selection from Hungarian material. They are notable for high yield, large grain and lodging resistance. New large-grained varieties with an improved protein content have been obtained by crossing some local material with Maksimirskiĭ Prolifik.

Maize. Trials of American maize inbreds and work on the production of Yugoslavian inbred lines are reported. The research in Serbia involves the use of the American single crosses WF_9 x 38–11 and WF_9 x 6 as testers. New productive varieties from Vojvodina include Novosadskaja Zolotaja Zubovidnaja [Novi Sad Golden Dent], which is distinguished by resistance to drought, *Helminthosporium* and *Tilletia*. A hybrid of this variety with Vukovarskaja Zubovidnaja [Vukovar Dent] outyields all other varieties by 10–20%. At Zemun, Serbia, a high-yielding variety Rumskaja Zubovidnaja [Ruma Dent] was obtained by selection and others, including a drought-resistant variety, by intervarietal hybridization.

3093 Săvulescu, T.
Dezvoltarea ştiinţei şi practicii agricole în R.P.R. Contribuţia Institutului de Cercetări Agronomice al Republicii Populare Romîne. (**The development of agricultural science and practice in the Rumanian People's Republic. Contribution of the Institute for Agronomic Research of the Rumanian People's Republic**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 3–146; also Bucureşti 1954 : Pp. 182.

The past work and present objectives of the above institute are reviewed. In the section devoted to plant breeding, it is mentioned that the following varieties have been released in recent years: Bărăgan 77 and Tîrgu Frumos 16 winter wheats, Academia RPR 48 spring wheat, Tîrgu Frumos 16 barley, Tîrgu Frumos 9 and ICAR 878 oats, Galben timpuriu [Early Yellow], Arieşan, ICAR 54, Lister Phister (? = Lester Pfister), Romînese de Studina [Studina Rumanian], Dobrogea, Portocaliu de Tîrgu Frumos [Tîrgu Frumos Orange] and Hînganesc maizes and ICAR 42/118 hemp. Studies on land races of various crops and introduction of varieties from other countries are also reported. Breeding work is in progress on cereals, fibre plants, potatoes, sugar beet and mangels and beans.

3094 **Six Monthly Review of the Department of Agriculture, Cyprus** 1955 : Pp. 88. (Mimeographed).

In addition to variety trials of cereals, cotton, sunflower and broad bean, the following activities are of interest:—

Wheat. Observations made on the rust reactions of introductions obtained through FAO are recorded in Appendix II.

In breeding for rust resistance, selection of crosses of local wheats with resistant introductions continued. Especially promising lines have been developed from (Kyperounda x Simpson Rongai) x Gabo and Giza (S–50–52) x (Kyperounda x 1/39). Back crossing to incorporate stem-rust resistance in local varieties continued.

Barley. In selecting hybrids from crosses involving local and introduced varieties, emphasis is being laid on early maturity. Breeding for straw strength was initiated by crossing the strong-strawed varieties Arivat and Feebar with Cyprus Black, Paphitico, Exadjion and Athenais.

3095 Rapport sur les travaux de recherche effectués en 1955. (**Report on research carried out in 1955**).
Serv. Bot. Agron. Tunis 1955 : Pp. 315. (Mimeographed).

The results of trials of Tunisian and introduced varieties of cereals, forage grasses, leguminous crops, flax, tomato and fruit trees are included in the above report (cf. *PBA*, XXV, Absts. 795–7 and 898 and XXVI, Abst. 199). Varietal differences in the susceptibility of hard and soft wheats to black rust and floury endosperm are noted; the hybrids (Florence x Aurore [Dawn]) x Thatcher, Bizerte x Thatcher and Florence x Irakié were highly resistant to black rust and Russello and Bugday [Wheat] were resistant to floury endosperm. The American flax variety B5128 gave good results.

3096 **Annual Report of the Department of Agriculture, Colony and Protectorate of Kenya, for 1954. Vol. II—Record of Investigations.** 1955 : Pp. 253.

Wheat. Selection of material from crosses made in previous seasons continued at Njoro and Molo. The occurrence of two new races of stem rust, K13 and K14, was confirmed (cf. Abst. 344). The beardless, white-chaffed, red-grained variety 351AS1B2 (117A x Regent 975·6) was released in 1954. It requires 5–5½ months to reach the harvesting stage at Njoro. It is resistant to races K1–12 of stem rust in seedling tests but in the field has been attacked by K9 and K12. It has shown resistance to yellow rust up to 8500 ft. and is recommended for altitudes of 7000–8500 ft. It has fair straw strength and moderately good yielding ability and baking quality. In addition, 261E, 354P3B2B and 356A12C are shortly to be released (cf. Abst. 3124).

Oats. Work is confined to testing of introductions. The American variety Vikota is to be released (cf. Abst. 3124).

Maize. Further inbreeding of local and introduced maize was effected at Njoro, the S_7 being reached in some lines. Reliance is, however, to be placed on quicker and more commercial methods than the classical hybrid techniques. Synthetics, in particular, offer a means of developing improved stocks under conditions in East Africa. Transference of resistance to *Puccinia polysora* to local maize, chiefly from material supplied by the East African Agriculture and Forestry Research Organization, continued.

Barley. The F_1 and F_2 of crosses of Research and Prior with Scandinavian varieties, made in

1953, were grown (cf. Abst. 1023). The Scandinavian barleys Kenia and Herta were released.

Pyrethrum. Work on single-plant selections of various origins continued. A high proportion of pyrethrin II appears to be associated with a high proportion of pyrethroids. The hybrids C43, C51, C77, C79 and M9 again gave good results in yield trials at different stations (cf. Abst. 1023).

3097 **Annual Report of the Department of Agriculture, Basutoland 1955** : Pp. 67.

Wheat and sorghum. Two Spitzkop varieties of wheat bred for the highveld of South Africa gave high yields at Maseru in the lowlands. At Machache, selection of wheat and sorghum for the mountains and foothills continued.

Maize. South African hybrids were superior in yield to open-pollinated varieties at Maseru.

3098 Kennan, T. C. D.
Matopos Research Station.
Rhod. agric. J. 1956 : **53** : 26–40.

Activities at the above station in S. Rhodesia included the following:—

Maize. Progress has been made in the development of yellow hybrids but so far none of these has outyielded Sahara.

Panicum miliaceum. A selection of dwarf proso, of interest as a grain variety for the granite sandveld, has been issued for trial on farms.

Sorghum. Selection 5140, giving high yields of grain, was released. Trial crosses were effected among parents originally of Haakdoorn and Hegari stock. Problems involved in the production of F_1 hybrids by means of male-sterile lines are discussed.

3099 **Annual Report of the Department of Agriculture, Colony of Mauritius, 1954** (1956) : Pp. 97.

Maize. The white-dent varieties Mexican 7, Mexican 13 and Mexican 16, obtained from the Maize Research Unit at Ibadan, Nigeria, showed promise with respect to resistance to rust (*Puccinia polysora*), now a serious disease in Mauritius. Although somewhat less resistant, the yellow dents Creole and Mexican 2 were also chosen for further study since growers prefer yellow-dent types.

Tobacco. Back crosses of black-shank resistant hybrids of Rg x flue-cured Virginia tobacco to the latter type show improved leaf colour and satisfactory curing properties (cf. *PBA*, XXV, Abst. 1710).

3100 **Progress Report of the Dominion Experimental Farm, Swift Current, Sask., Canada 1948-1954** (1955) : Pp. 55.

Cereals. The main results of variety trials of wheat, oats, barley and rye are reported.

Grasses. Progress has been made in developing strains of *Agropyron intermedium*, improved in winter hardiness and forage and seed production. Finer-stemmed types of *A. elongatum* have been selected. An attempt is being made to select strains of *Elymus junceus* giving higher seed yields.

Lucerne. The hardy, drought-resistant, creeping-rooted variety Rambler has been developed (cf. Abst. 467).

3101 **Report of the Governing Body and the Principal's Report of the Imperial College of Tropical Agriculture, St. Augustine, Trinidad, for 1954–55** (1956) : Pp. 59.

Cacao. Crosses between S_1 trees of ICS1 and ICS45 were planted. Provision of seedling material, representing crosses between five ICS clones and ten witches'-broom resistant Amazonian Forastero clones, for planting at the Centeno Central Experiment Station, continued. About 500 seedlings were inoculated with witches'-broom disease at the germination stage in an attempt to elucidate the inheritance of resistance. *Theobroma subincana* was back-crossed to its hybrids with *Th. obovata* and *Th. grandiflora*. Hybrids of *Herrania* spp. have been raised in order to investigate interspecific relationships in the genus. Study of the inheritance and mechanism of incompatibility continued.

Banana. Breeding to develop improved ♂ parents continued. New selections were sent for trial in Jamaica. Further investigations were carried out on seed fertility in edible bananas and on cytological relationships among wild diploid hybrids. A collection of wild bananas has been made in south-east Asia. *Musa banksii* from New Guinea, with large well-shaped bunches of fruit, and some edible diploids from New Guinea and Malaya are regarded as the most promising breeding material in the collection.

3102 **66th Annual Report of the South Carolina Agricultural Experiment Station of the Clemson Agricultural College 1954** : Pp. 52.

Cotton. Several new interspecific hybrids with long staple again showed promise in preliminary tests.

Cucumber. The early downy-mildew resistant varieties Stono and Ashley have been developed. They keep their colour well in hot weather and give high yields of medium-long fruits.

3103 **Annual Report of the Director of Agriculture, British Guiana 1953 and 1954.** 1956 : Pp. 45 and 58.

Rice. Progress in breeding erect nonshattering varieties suitable for mechanical harvesting is reported. Sterility, in some cases as high as 80% in the F_1 hybrids, has decreased in advanced generations, reaching ordinary proportions in the F_6. The local strains 79, D85–42 and D52–37 have proved to be valuable parents. Shortness has been successfully fixed; several hybrids are 30 in. in height whereas the local types grow 48–54 in. high.

Sugar cane. Testing of varieties bred in British Guiana and Barbados continued. Varietal reaction to leaf scald is receiving attention.

3104 BOERGER, A.
La Estanzuela. Centro de genética vegetal aplicada e investigación agronómica en general. (**La Estanzuela. A centre of applied plant genetics and agricultural investigation in general**).
Montevideo 1954 : Pp. 19.

An outline is given of the activities, past and present, of this institute. Among its achievements are the production of the wheats Pelón 33 [Awnless 33] and Universal II, which almost doubled the average yields of wheat, a series of wheats suitable for late sowing, others giving a crop of hay followed by a crop of grain and many disease-resistant varieties. The wheat DP, a hybrid from Rio Negro x Litoral Precoz [Early Littoral], has yielded 15–20% more grain than Rio Negro. DQ is a hybrid of Litoral Precoz x Klein 157 and has given yields of grain reaching 34 c. per ha. in exceptional cases. Many of the wheat varieties from La Estanzuela have been used in the neighbouring countries of Argentina and southern Brazil, either for cultivation or for hybridization, and also in Chile. A number of oat selections resistant to *Puccinia coronata* have been produced, the linseed varieties Tabaré and La Estanzuela H2 are resistant to *Fusarium lini* and the dual-purpose flax La Estanzuela E2E3 is resistant to pasmo (*Septoria linicola*). Synthetic maize varieties equal to commercial hybrids in yield and the sunflower La Estanzuela 30 combining high yield of seed and oil with erect habit are other achievements mentioned. In forage crops reference is made to ryegrass 284, resistant to green aphids (*Schizaphis graminum*) and to *Puccinia coronata*.

3105 **Report of the University of Sidney School of Agriculture.** 1955 : No. 1 : Pp. 79.

Wheat. The twelve international differential varieties have proved unsatisfactory in distinguishing between local stem rust races. One new biotype of race 21, three of race 126 and four of race 222 have been described and are recognized by their behaviour on the additional varieties Yalta, Eureka, Celebration and a strain derived from a *Triticum timopheevi* cross. Among other varieties of use in distinguishing local biotypes are Thew, Gabo, Gaza and Spica. Investigations with a uniformly susceptible variety showed that the older biotypes, from which later ones with a wider host range have developed by mutation, are the most aggressive in competition. Genetic recombination, giving an entirely new rust, resulted from greenhouse infection of *Thalictrum* with teleutospores. The resistance to certain stem rusts appears to be allelic in the two Kenya wheats 744 and 117A but additional nonallelic genes determining resistance to other races are also present. Marquillo and its derivatives Thatcher and Hochzucht [Pedigree] show multigenic inheritance of resistance, all three carrying the same major genes but the last two having fewer of the minor genes. In a derivative from a wide cross of Khapli, resistance was dependent upon two factors independent of those in the above varieties, one dominant and one recessive, each conferring partial resistance with additive effects. The gene for resistance in Egypt NA95 appears to be allelic with that in Kenya 774 and 117A. Attempts are being made to increase genetic diversity by incorporating resistance genes from inbred lines of rye into wheat. The inheritance of resistance to leaf rust is also under investigation and new sources of resistance are being sought. In breeding for rust resistance, crosses are made, wherever possible, to combine two different genotypes each controlling resistance to all the local rusts.

Oats. The resistant variety Garry, which has been widely used in breeding for stem rust resistance, has been found to consist of a mixture of different forms carrying one to three dominant genes for resistance to races 2 and 12, one or two of the genes conferring resistance to race 10 also. Two genes controlling resistance to all three races were linked, with a crossing-over value of $26{\cdot}69 \pm 1{\cdot}8$ units.

A search for new sources of resistance to crown rust is in progress. Landhafer has a partially dominant gene for resistance similar to one of the complementary factors in Bond, and Santa Fe has a different one apparently allelic to the second complementary factor in Bond. The partially dominant Santa Fe factor appears to be allelic or closely linked to the partially dominant gene of Trispernia and the dominant gene for seedling resistance in Ukraine.

Fourteen races of loose smut falling into two groups when tested on Fulghum have been found. Black Mesdag is susceptible to several of these races, Joanette to one, while Black Diamond and Victoria are resistant to all races.

Rye. The inheritance of chlorophyll aberrations and of resistance to leaf rust of rye and stem rust of wheat is being studied in inbred lines.

Barley. A new and aggressive leaf-rust mutant pathogenic on several formerly resistant varieties has been found. Two independent genes controlling resistance to the usual form of leaf rust are known, one conferring a high degree of resistance and linked with the mildew resistance factor *Mlp* in linkage group II and the other giving semiresistance.

Investigations on factors for mildew resistance indicate that an allelic series is involved. Histological reaction to infection is being studied and compared in resistant and susceptible varieties.

Subterranean clover. The varieties Wenigup, Baulkamough North and CPI15257, an introduction from Spain, have shown resistance to all the races of *Uromyces trifolii* var. *subterranei* so far tested. Yarloop and Mulwala are resistant to one or more races. Crosses are being made between commercial and other varieties showing some degree of resistance.

3106 **Annual Report of the Department of Agriculture, Tasmania for 1954–55** : Pp. 50.

Wheat. Under rust-free conditions at the Cressy Research Farm, one advanced rust-resistant line of Hofed x Braemar and another of Celebration x Macquarie outyielded the control Major by an appreciable margin. The improvement in baking quality secured in several hybrid lines has only been expressed to an appreciable degree in the drier seasons and has shown considerable variation in samples from different districts.

Potato. Progress was made in breeding to introduce resistance to late blight in varieties of the Brownell type.

Tomato. Of the F_1 hybrids of Vetomold strains tested at the New Town Experimental Station, only one outyielded its parents, with 20% superiority.

3107 De Cillis, U.
L'applicazione delle radiazioni nel miglioramento genetico vegetale. (**The application of radiations in the genetic improvement of plants**).
Sementi elette 1956 : **2** : No. **4** : 10–13.

A brief review is given of experiments carried out in Sweden, the USA, Canada and elsewhere in which the greater efficiency of neutrons as compared with other types of radiation has been demonstrated. A rust-resistant oat, and maize forms with shorter internodes, greater tillering capacity and earlier maturity are mentioned among the valuable mutants obtained up to date.

3108 Pisarev, V. E.
(**Using artificial light for acceleration of the breeding process**).
Trud. Inst. Fiziol. Rasten. K.A. Timirjazev (Proc. Timirjazev. Inst. Pl. Physiol.) 1955 : **10** : 110–12. [Russian].

The writer's work on indoor breeding of wheats in Siberia in 1915 and breeding of root crops in Moscow before the Second World War is mentioned. Good results were obtained in Moscow in growing turnip rape, turnip and other root crops for seed in artificial light and also on intervarietal hybridization of these plants under greenhouse conditions. It is thought that artificial illumination of glasshouse cultures can be dispensed with on most Soviet territories east of the Urals.

3109 Bornás y de Urcullu, G.
El registro de variedades de plantas. (**The register of plant varieties**).
An. Inst. nac. Invest. agron., Madr. 1955 : **4** : 161–84.

The system of registration for cultivars of certain agricultural and horticultural crops recently instituted in Spain is described. The operation of various systems for the control and protection of varieties in the Netherlands, USA and elsewhere is examined, as are the activities in this connexion of FAO, ASSINSEL, the International Committee on Horticultural Nomenclature and Registration and the OEEC.

3110 Sizov, I. A.
(**Results and prospects of scientific research**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 1 : 25–27.

This report on breeding work at the Institute of Plant Industry, notably on maize, potatoes and vines, mentions accomplished and contemplated enlargements of the institute's collection of economic plants mostly by material from Soviet territories. The work on maize comprises the production and testing of inbreds and hybrids between varieties differing with regard to date of maturity; the aim is to obtain forms productive of grain and forage in the Non-chernozem Belt. Among the recent achievements in potato breeding are the new early varieties Puškin and Detskoe Selo which are resistant to wart and *Phytophthora* and varieties such as Hibiny 3 and Šuntukskiĭ Dvuhurožăinyĭ [Two Harvests Šuntuk], characterized by the absence of dormancy which enables the growers in some regions to obtain two harvests in a season. Reference is made to interspecific hybrids showing resistance to Colorado beetle. The following new vines were bred at the Central Asiatic Branch Station of the institute: VIR 1 [Institute of Plant Industry 1], Pobeda [Victory], Ranniĭ VIR [Early Institute of Plant Industry], Muskat VIR [Muscat Institute of Plant Industry] and Uzbekistan. All these are distinguished by large grapes, fine flavour and good transportability.

3111 GORŠKOV, I. S.
(For Mičurinist traditions in science).
Bot. Ž. (Bot. J.), Moskva 1955 : **40** : 680–92. [Russian].

Mičurin is stated to have accepted Darwin's theories, and to have regarded hybridization as the principal evolutionary force. Recent Soviet achievements in distant hybridization are mentioned (cf. Abst. 1673).

3112 CICIN, N. V.
(Distant hybridization as a method of creating new varieties and new cultivated plants).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 20 : 3–6. [Russian].

This report of various distant crosses attempted in the USSR mentions some hybrids of economic value and outlines administrative measures designed to promote research on distant hybridization. The writer's own work on hybrids of *Triticum* x *Agropyron* and the multiple hybrids of *Secale* x *Triticum* x *Agropyron* and of *Triticum* x *Secale* x *Agropyron* x *Elymus* is referred to. Other distant hybrids include Turkmenian cottons which shed their leaves before harvesting time, sugar beets notable for high root and sugar yields, mosaic-resistant tobaccos, a new kind of forage plant obtained by crossing *Helianthus annuus* with *H. tuberosus* and new forms of forest and fruit trees. Among the latter are high-quality apples which are hardy under Siberian conditions, hybrids between almond and peach, with edible flesh, from Georgia and hybrids between apricot and peach from Uzbekistan which surpass all central Asiatic varieties of apricot and peach in yield and quality.

3113 KOPETZ, L. M.
Gibt es tagneutrale Pflanzen? **(Are there day-neutral plants ?)**
Bodenkultur 1956 : **8** : 369–73.

It is suggested that the term day neutral is often applied erroneously to long-day or short-day varieties of crop plants whose true photoperiodic requirements fail to become apparent in the day-length conditions of the region in which they are cultivated.

3114 Botanisch rassenonderzoek. **(Botanical research on varieties).**
StudKring. PlantVeredel. Wageningen. Versl. 1955 : **46** : 623–27.

Morphological criteria that may be employed in distinguishing one variety from another are discussed with special reference to flax and French beans (cf. Abst. 1099).

3115 RUDORF, W.
Die Möglichkeiten der Züchtung ernährungsphysiologisch günstiger Planzensorten. **(The possibilities of breeding plant varieties with desirable nutritional characters).**
Angew. Chem. 1955 : **67** : p. 356. (Abst.)

In this paper, read at a meeting of the German Society for Nutrition held at Mainz, 13–15 April, 1955, the possibilities of breeding to improve characters of direct nutritional value in crop plants, such as protein, fat and carbohydrate content, as well as those of indirect value, such as colour, shape, flavour and texture, were discussed. The need for further information on the chemistry of the substances involved in the latter group of qualities was pointed out.

3116 SAHA, J. C.
Plant introduction as an aid to improvement of food and fodder crops.
Sci. & Cult. 1956 : **21** : 507–13.

A shortened version is given of a paper read at the forty-second session of the Indian Science Congress held at Baroda in January, 1955. The importance of plant introduction in establishing new crops and in breeding in various countries is described, with particular reference to sugar cane, potato, tomato, rice, lucerne, soya bean, mung, tapioca and hybrid maize.

3117 Leroy, J. F.
Les migrations humaines entre le Nouveau et l'Ancien Monde et l'origine des plantes cultivées. Controverses actuelles. (**Human migrations between the New and the Old World and the origin of cultivated plants. Current controversies**).
J. Agric. trop. Bot. appl. 1955 : **2** : 211–15.

The controversy between supporters and opponents of the diffusionist theory is discussed with reference to the Kon Tiki expedition and E. D. Merrill's book entitled "The botany of Cook's voyages" (cf. *PBA*, XXV, p. 636).

3118 Wagner, S.
Sortenwahl und Klima. (**Choice of varieties and climate**).
Kärntner Bauer 1956 : **106** : 211–12.

The author points out that some varieties of crop plants are more sensitive to inclement climatic conditions or sudden changes in temperature than others. Recent experiences in Carinthia, Austria, have suggested that pedigree varieties suffer more as the result of bad summers than do local land races.

3119 Dunin, M. S.
(**The principal directions and results of plant immunity research at the Timirjazev Academy**).
Izv. Timirjazev. seljskohzjaĭstv. Akad. (News Timirjazev agric. Acad.) 1955 : No. 3 : 59–70. [Russian].

This report, dealing generally with the breeding of economic plants for immunity, includes an appreciation of the work of N. I. Vavilov. In particular, his research on specialization in disease-producing organisms and on genetical differentiation between cultivated plants and their wild relations are rated highly. However, Vavilov is still criticized for some Mendelian errors, especially for disregarding correlations between external conditions and immunity and for considering acquired immunity to be a rare phenomenon in plants.

3120 Lal, K. N., Mehrotra, O. N. & Tandon, J. N.
Physiological basis of drought resistance in plants.
Bull. bot. Soc. Beng. 1954 : **8** : 171–85.

In this review, which has 310 references, the following topics are discussed with particular reference to differences between drought-resistant and tolerant plants: effects of drought upon protoplasm, sap, cell characteristics and water content; water relations of the plant in connexion with soil moisture and root development; water requirements; effects of fertilizers on drought resistance; determination of drought resistance; and the effects of drought upon growth and metabolism.

CEREALS

3121 **Detailed descriptions of varieties of wheat, barley and oats.**
Nat. Inst. agric. Bot. 1956 : unpaginated.

Revised lists of recommended varieties, and descriptions of Peko, Svenno, N59 and Banco, which have been added to the 1956 list for wheat as provisionally recommended varieties, are given on loose leaves for insertion in the handbook published in 1954 (cf. *PBA*, XXV, p. 456).

Peko is a spring wheat (Peragis x Heines Kolben) from Germany, released in that country in 1947. Developed by F. Heine, it has proved to be highly resistant to yellow rust and loose smut and has outyielded Atle. Although its straw is taller than that of Atle, its resistance to lodging is good. It behaves as a soft wheat in milling and shows promise for biscuit manufacture. Svenno, a spring wheat selected from Kärn I [Kernel I], was first distributed in Sweden in 1954 (cf. *PBA*, XXIV, Abst. 194 and XXV, Abst. 1837).

The hard winter-wheat N59 was developed from a single-plant selection of a French type by Miln and Co., Chester, England, and first distributed in 1948. In northern England and Scotland it produces substantially higher yields than Bersée, ripening about 3 days later than this variety. It is slightly susceptible to yellow rust and highly susceptible to loose smut. Its bread-making quality is not high. The winter wheat Banco, of complex parentage, was released in Sweden in 1953 (cf. *PBA*, XXIII, Abst. 1847).

3122 Mikkelsen, A. K.
Aktuelle kornsorter 1956. (**Current grain varieties, 1956**).
Samvirke 1956 : **51** : 131–33.

Notes are provided on varieties of oats, barley, spring wheat and peas recommended for cultivation in Norway.

3123 Korte beschrijving van de nieuwe rassen, welke in 1956 op de interprovinciale proefvelden worden beproefd en niet voorkomen in de 31ste beschrijvende rassenlijst voor landbouw-gewassen 1956. (**Short description of the new varieties that were tested on the interprovincial trial fields in 1956 and do not occur in the 31st descriptive variety list of agricultural crops, 1956**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1956 : **12** : p. 108.

Brief information is presented on the pedigree, degree of winter hardiness, length of straw and period to maturity of 12 winter wheats, 7 winter rye varieties and 5 winter barleys tested in interprovincial trials in the Netherlands in 1955 but not included in the 1956 descriptive variety list (cf. p. 701). The Swedish rape Matador also receives mention.

3124 Thorpe, H. C. & Dixon, G. E.
Release of new cereal varieties—1955.
E. Afr. agric. J. 1956 : **21** : p. 164.

The wheats 354P3B2B, 356A12C and 261E, developed at Njoro, and the American oat variety Vikota have been released in Kenya. Bred from Narigo x Stirling, 354P3B2B is a midseason leaf-rust resistant variety. In seedling tests it has shown susceptibility to races K9 and K11 of stem rust but has not been attacked in the field. Up to about 7000 ft. it is resistant to yellow rust. Its straw strength is fair and baking quality good. A selection from 184P2A1E x 192Q2A(L), 356A12C is resistant to races K9–K13 of stem rust. It also possesses resistance to leaf rust, and to yellow rust up to 7000 ft. It matures fairly early. Its baking quality and straw strength are fair. A further selection of cross 261, 261E has good baking quality and early maturity with stronger straw than 261R. All three varieties are white-chaffed and white-grained, 354P3B2B being beardless and the other two bearded. Each is recommended for altitudes of 6000–7000 ft.

3125 Aleksandrova, L. N.
(**New varieties of cereals**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 2 : 24–26.

The winter wheat Obiljnaja [Abundant] and the rye Izumrud [Emerald], both from the Leningrad Agricultural Institute, outyielded the older varieties in the Pskov and Leningrad provinces by 3 c. per ha. Mention is made of an early maize variety Leningradka which transmits earliness to its progeny when crossed with productive and vigorous south-Russian varieties.

3126 Berčenko, B.
(**The institute and experimentation on collective farms**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 2 : 22–24. [Russian].

Mention is made of new varieties of cereals, bred at the Institute of Genetics, which are being tested on Ukrainian collective farms. The winter wheat hybrid of Odessa 3 x Odessa 16 outyields both its parents by 3–5 c. per ha. The maize Odessa 10 produces up to 100 c. grain and 700–1000 c. forage per ha. and the barley Odessa 17 is notable for winter hardiness and high yield.

3127 Kornslaga i år. (**Cereal varieties this year**).
Bondevennen 1956 : **59** : 194–97.

Short accounts are given of the origin and agronomic characters of a number of oat, barley and wheat varieties recommended by the Norwegian National Cereal Office.

3128 Bjaanes, M.
Kornforedling. (**Cereal breeding**).
Samvirke 1956 : **51** : 144–49.

A popular account of breeding in Norway during the past 50 years is presented, particular reference being made to the history of the production of the spring wheat Norrønd and the two-rowed barley Domên.

3129 Sortförsök med höstsäd i Mälar-Hjälmarbygden. Sammanställning av försöksresultaten under åren 1945–1953. (**Varietal trials of winter cereals in the Mälar-Hjälmar area. The combined results of varietal trials of winter wheat and winter rye during the years 1945–1953**).
Försök o. Undervisning 1955 : 1–30.

Details are given of the hardiness, grain yield, quality and straw strength of 14 winter wheats, nine winter rye varieties and two winter barleys, tested at localities in the Mälar-Hjälmar area, Sweden.

3130 **Supplementary variety tests with cereal crops.**
Rep. Cereal Crops Div., Centr. exp. Fm., Ottawa 1956 : No. 153 : Pp. 31. (Mimeographed).

The results of tests carried out on wheat, oat, barley, flax and field-pea varieties in Ontario and Quebec to supplement the trials conducted at the Central Experimental Farm are summarized in tables.

3131 THURMAN, R. L. & ROSEN, H. R.
Small grain varietal yield trials, 1951–1955.
Rep. Ser. Arkans. agric. Exp. Sta. 1956 : No. 54 : Pp. 18.

The results of yield trials of wheat, oat and barley varieties at several centres in Arkansas are summarized.

3132 FERWERDA, F. P.
Recurrent selection als veredelingsmethode voor kruisbevruchters. (**Recurrent selection as a breeding method for cross pollinators**).
StudKring. PlantVeredel., Wageningen. Versl. 1955 : **48** : 650–58.

The author outlines difficulties involved in the breeding of crop plants that are cross pollinators. The use of the recurrent-selection method in breeding hybrid maize in the USA (cf. *PBA*, XXII, Abst. 346) is then described and compared with Wellensiek's method of mass test crosses (cf. *PBA*, XIX, Abst. 2213). At Wageningen, Netherlands, the recurrent selection method gave promising results when applied to rye.

3133 MÜLLER, K.-H.
Die Getreidesortenversuche 1954. (**Cereal variety trials, 1954**).
Z. landw. Vers.- UntersuchWes. 1955 : **1** : 340–51.

Based on the results of trials conducted at a number of centres and under varying climatic conditions in 1954, recommendations are made as to the varieties of wheat, oats and barley best suited to cultivation in different areas of Eastern Germany (cf. *PBA*, XXV, Absts. 200–1). Of the winter wheats tested, Hadmerslebener IV and Bastard II [Hybrid II] gave the best results. Peko outyielded all other spring wheats but the baking quality of its grain was poor; Koga, on the other hand, gave low yields but possessed excellent baking quality. Among the oats, Edelweiss and Goldregen III [Golden Rain III] produced the best all-round results. Rekord [Record] was the highest yielder among the winter barleys. Friedrichswerther Berg gave low yields but was extremely winter hardy. Mahndorfer was distinguished by its early maturity and good resistance to lodging. Freya, Elsa and Saale proved superior among the spring barleys.

3134 SĂLĂGEANU, N. & TAȘCĂ, C.
Despre intensitatea transpirației în timpul zilei și în decursul perioadei de vegetație și despre coeficientul economic al transpirației la unele cereale. (**On the intensity of transpiration throughout the day and during the vegetative period and on the economic coefficient of transpiration of some cereals**).
Bul. Ști. Secț. Ști. Biol. Agron. Geol. Geogr. 1955 : **7** : 247–76.

Transpiration rate throughout the day in June and July was studied in a series of Rumanian and introduced varieties of spring and winter wheat, spring and winter barley and spring oats. The economic coefficient of transpiration, water transpired/organic matter accumulated, ranged from 442 in the winter wheat A–15 to 1185 in the winter wheat Bărăgan 77.

3135 HIRATSUKA, N. & MIYASHIMA, S.
(**Studies on the rust resistance of cereals. V. Studies on the susceptibility of *Triticum* and related plants to yellow rust**).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 193–201. [Japanese].

Numerous varieties and strains of *Triticum*, *Aegilops*, *Hordeum*, *Agropyron*, *Elymus*, *Avena*, *Haynaldia*, *Lolium*, *Bromus* species and of *Triticum* x *Aegilops* and *Triticum* x *Agropyron* were examined for their reaction to *Puccinia glumarum* '31'. The species including the most resistant forms are as follows: *T. spelta*, *T. compactum*, *Aegilops ovata*, *Ae. variabilis*, *Ae. kotschyi*, *Ae. columnaris*, *Ae. triaristata*, *Ae. comosa*, *Ae. uniaristata*, *Ae. speltoides*, *Ae. aucheri*, *Hordeum spontaneum*, *H. vulgare*, *H. distichum*, *H. murinum*, *H. nodosum*, *H. pusillum*, *H. jubatum*, all the *Agropyron* species investigated except *A. schribneri*, *E. arenarius*, *E. canadensis*, *E. dahuricus*, *E. mollis*, *Avena sativa*, *Haynaldia villosa*, *Lolium remotum* and most of the *Bromus* species.

3136 GUYOT, L. & MASSENOT, M.
Observations et expérimentations sur la rouille noire des céréales et des graminées au cours des années 1951 à 1953. (**Observations and experiments on black rust of cereals during the years 1951 to 1953**).
Ann. Inst. nat. Rech. agron., Paris : Sér. C. : 1955 : **6** : 89–118.

The incidence of different physiological races of *Puccinia graminis* on wheat, barley, oats, rye and various meadow grasses in France is recorded, together with the results of laboratory experiments carried out at the National School of Agriculture, Grignon, on specialization in this fungus. A wide range of European varieties of the principal cereal crops, as well as numerous introductions from North and South America, were tested for their reaction to different physiological races. Particular attention was paid to varietal resistance and susceptibility in wheat and detailed data on the results of these studies are tabulated. The virulent races 40, 17 and 21 and the somewhat less virulent race 14 were the most prevalent on wheat in France in the period under review and, of these, race 40 caused by far the greatest damage (cf. *PBA*, XXIV, Abst. 254).

3137 CUMMINS, G. B. & CALDWELL, R. M.
The validity of binomials in the leaf rust fungus complex of cereals and grasses.
Phytopathology 1956 : **46** : 81–82.

It is recommended that, because of its multiseptate teleutospores, *Puccinia elymi* be regarded as a distinct species from the leaf rust organism with two-celled teleutospores. The oldest valid name for the latter species is *P. recondita* described in 1857, *P. rubigo-vera* being a later synonym (1882).

3138 COOPER, J. P.
Developmental analysis of populations in the cereals and herbage grasses. 1. Methods and techniques.
J. agric. Sci. 1956 : **47** : 262–79.

This paper is the first in a series which is to deal with investigations carried out at the Welsh Plant Breeding Station, Aberystwyth, to analyse ecological differences between populations in terms of the timing of inflorescence development and its corollary, the relationship between seed production and continued vegetative growth. A description is given of the standard greenhouse methods, devised for the rapid testing of response to vernalization and photoperiod, using *Triticum* spp. and *Lolium* spp. It is suggested that the methods are applicable in (1) the agronomic classification of populations and prediction of their behaviour under specified conditions of local climate and farming practice, (2) selection and progeny testing and (3) evaluation of the potential genetical variation within populations and study of the adaptive changes occurring under selection.

WHEAT

3139 LÓPEZ-RÍOBOO TENREIRO, F., TÉLLEZ MOLINA, R. & PRIETO HERAUD, E.
Ensayos comparativos de variedades de trigo. (**Comparative tests of wheat varieties**).
An. Inst. nac. Invest. agron., Madr. 1955 : **4** : 189–401.

In connexion with the recently instituted register of plant varieties in Spain tests were carried out in representative areas of the country with 91 wheat varieties. Data are presented showing the yield of the varieties compared with the standard variety for each zone. In several zones the most outstanding variety was Pané 247, others receiving favourable mention being Aradi, Involcable Navarro [Navarro Nonlodging], Canaleja, Aragón 03 and several Italian wheats.

3140 GADEA, M.
Sexto año de experiencias con nuevas variedades de trigo. (**Sixth year of experiments with new wheat varieties**).
An. Inst. nac. Invest. agron., Madr. 1955 : **4** : 573–613.

The observations of previous years (cf. *PBA*, XXV, Abst. 2900) have been continued.

3141 Forsøg med Hvedesorter 1952–1955. (**Trials of wheat varieties, 1952–1955**).
Tidsskr. Frøavl. 1956 : No. 525 : 368–70.

Tables and notes on the performance of eleven varieties tested at ten stations in Denmark during the above period are presented. Heine's VII gave the highest average grain yield.

3142 WHITESIDE, A. G. O.
The control of wheat varieties in Canada.
3. Internat. Brotkongr. Hamburg 1955 : unpaginated.

With reference to western Canada, an outline is given of breeding, variety testing and licensing, seed propagation, commercial grading of varieties, changes in the varietal composition of exported wheat brought about by the introduction of new varieties and the varietal position in 1954.

3143 SCHLEHUBER, A. M. & YOUNG, H. C. (JUN.)
Concho winter wheat.
Bull. Okla. agric. Exp. Sta. 1955 : No. B-453 : Pp. 18.

A detailed account is given of the hard wheat Concho, developed from a cross of Comanche with a selection of Blackhull x Hard Federation (cf. *PBA*, XXIV, Abst. 1023 and XXVI, Abst. 1075).

3144 Taylor, R. L. & Brinsmade, J. C.
Gasser wheat, a new grain for Alaska.
Circ. Alaska agric. Exp. Sta. 1955 : No. 21 : Pp. 8.

Developed from Diamond x Khogot at the Alaska Agricultural Experiment Station, Gasser combines high yielding capacity with desirable agronomic properties, being superior to the standard Khogot in resistance to lodging and shattering and in grain quality. It is recommended for producing grain to feed poultry and livestock and for early sowing in the Matanuska and Tanana Valleys.

3145 Boerger, A.
Enfoque de aspectos actuales de nuestro problema triguero. (**The essence of the present situation of our wheat problem**).
Montevideo 1955 : Pp. 24.

In this general discussion of the problem the question of variety testing is touched upon and reference is made to the "international tests" made in collaboration between Uruguay, Argentina and Brazil. In Uruguay the best yields have been given by the locally produced variety La Estanzuela DQ, the Argentine variety Klein Lucero [Morning Star] and the Brazilian Bagé, the two latter having wheats from Uruguay in their parentage.

Reference is also made to a method elaborated by Fischer in which the baking quality of a wheat can be estimated on a fraction taken from a single grain, by the use of which strong endosperm has been shown to be dominant to floury.

3146 Brown, C. W.
Wheat varieties. Recommendations for 1956 sowing.
Agric. Gaz. NSW 1956 : **67** : 58–66.

The varietal position in New South Wales is discussed and the recommended wheats Bencubbin, Bordan, Celebration, Charter, Curlew, Festival, Ford, Gabo, Insignia, Javelin 48, Kendee, Koala, Pinnacle, Spica and Warigo are described.

3147 Rogner, W.
Lässt sich die Anbauwürdigkeit von Sorten durch einen zusammenfassenden Zahlenwert ausdrücken? (**Can the agronomic merits of varieties be expressed by means of a comprehensive numerical value ?**)
Saatgutwirtschaft 1956 : **8** : 167–70.

A point system for the evaluation of new wheat varieties and for use in variety trials is outlined. Based on total yield, baking quality, time from sowing to harvesting and resistance to rusts, mildew, lodging, shattering and sprouting in the ear, it is claimed to be of particular value in comparing varieties of similar yielding capacity; the proposed scale of assessment would not be employed independently of varietal descriptions or detailed data on the performance of a given variety in field trials but would be used in collaboration with conventional methods to provide a comprehensive rating of the general agronomic value of the variety in question.

3148 **World catalogue of genetic stocks.**
Wheat. Supplement No. 5. FAO UN, Rome 1955 : Pp. 17. (Mimeographed).

This supplement contains contributions from Belgium, Egypt, India, South Africa and the USA (cf. *PBA*, XXV, Abst. 1830).

3149 Papp, Zs.
Őszi búzafajták termésalakulása 1954-ben. (**Crop production of winter wheat varieties in 1954**).
Növénytermelés 1955 : **4** : 147–60.

Kompolt F169 and Kompolt B7, both selections from F481, had a shorter vegetative period and greater stiffness of straw and gave higher yields than the parental variety. The Bánkút varieties also gave high yields. All the above wheats were, however, inferior to older varieties in baking and milling qualities.

3150 Téllez Molina, R.
Ensayos comparativos de rendimiento de trigos híbridos (1953–54). [**Comparative tests of yield of hybrid wheats (1953-54)**].
An. Inst. nac. Invest. agron., Madr. 1955: **4** : 613–51.

Further data are added to those reported in *PBA*, XXV, Abst. 2900. Aradi and Canaleja have again given good results and others found promising were Orgaz, Pané and hybrids 435 and 400–2.

3151 Artemova, A. S.
(**Growing the winter wheat-*Agropyron* hybrid 186 in southern Kazahstan**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 20 : 12–16. [Russian].

Hybrid 186 has consistently outyielded Kooperatorka, Ukrainka and other standards in the irrigated and rainfed districts of the Alma-Ata and Taldy-Kurgan provinces.

3152 DUMON, A. G. & LAEREMANS, R.
Het kweken van zomertarwerassen. (**The breeding of spring wheat varieties**).
Agricultura, Louvain 1956 : **4** : 63–80.

The results of crosses effected at the Laboratory of Applied Genetics, Louvain University, Belgium, between the winter wheat Hybride du Jubilé [Jubilee Hybrid] and Fylgia are communicated. The F_1 plants were similar morphologically to the Fylgia parent. An analysis of the F_2 showed that the brown glumes of Fylgia were dependent upon a single dominant gene and that the reddish colour of the grain in both parent varieties was determined by three independently inherited polymeric genes. Spring habit was dominant over winter habit in the F_1; in the F_2, 230 plants with a spring habit and 40 with a winter habit were found. The resistance of Hybride du Jubilé to *Ustilago tritici* proved dominant to the susceptibility of Fylgia. Two new high-yielding spring wheats, Fylby and Phoebus (cf. *PBA*, XXV, Abst. 1880), were selected from the cross described above. Both have reddish grain and possess good resistance to lodging and *U. tritici*.

3153 **Wisconsin introduces new spring wheat.**
What's New Crops Soils 1956 : **8** : No. 7 : p. 29.

Developed at the University of Wisconsin, the spring wheat Russell is resistant to loose smut, powdery mildew and Hessian fly and is moderately resistant to most of the prevalent races of stem rust. It is susceptible to leaf rust, however, and moderately susceptible to bunt. It is regarded as suitable for fodder.

3154 ROSSI, M. R.
Mejoramiento en trigo. (**Wheat breeding**).
Publ. Escuel. Agron., B. Aires 1954 : No. 3 : Pp. 152.

This thesis starts with an historical account of wheat growing in Argentina, with special reference to early efforts made to improve the varieties grown, and the production of the first hybrid variety 38 MA by Backhouse. The botanical features of the wheat species are described. In discussing the principles of plant breeding, the chances of effecting successful introductions of foreign varieties are examined. The techniques of selection and hybridization are explained and the plan of crossing in operation in the faculty of agronomy at Buenos Aires is explained. An outline is given of existing knowledge on the inheritance of such characters as resistance to various species of rust, smut and other fungi and a number of morphological and agronomic features, and the effect upon them of factors such as temperature, light, humidity and soil properties. The occurrence of disease resistance in different species of *Triticum* and related genera is examined and the use of such species in breeding resistant varieties is illustrated by the production of wheats such as Hope, Thatcher and Newthatch in the USA.

3155 ZAPATA B., M., GARCÍA, L. A. & REYES N., R.
Híbridos de trigo promisorios para Colombia. (**Wheat hybrids promising for Colombia**).
Agricultura trop. 1956 : **12** : 261–62.

Two hybrid wheats produced in Colombia, Menkemen and Bonza [Bonze], ripen 30–40 days before the old varieties Bola Picota and Ciento Cincuenta [One hundred and fifty], which they also excel by 30–40% in grain yield. Some newer hybrids which exceed Menkemen and Bonza in yield, resistance to *Puccinia glumarum* and *P. tritici* and quality are listed.

Atti del 1° Convegno Nazionale sulle Novità Granarie, Vicenza—11 Settembre 1955. (**Proceedings of the 1st National Congress on Wheat Novelties, Vicenza, 11 September 1955**).
Genet. agr. 1955 : **5** : 307–456.

3156 *Biagiotti, M. Nuove varietà di frumento dalla ibridazione naturale "Alessandro Vivenza". (Alessandro Vivenza, new wheat varieties from a natural cross). (pp. 316–22).*

A series of wheat varieties selected from a natural cross of Mentana x Frassineto are described as late in resuming growth in the spring but early in maturity, resistant to rusts, frost, summer heat and foot rot. The original selection, named Alessandro Vivenza, was somewhat weak in the straw but a selection from it, characterized by a squarehead ear and shorter straw, is satisfactory in this respect. Another selection, Vivenza Celestino [Blue Vivenza], is rather taller and has larger ears. All three forms produce strong flour of good quality, in which respect they excel most other wheats now being grown in Italy.

3157 *Bonvicini, M. Le varietà di grano in diffusione e in prova dell'Istituto di Allevamento Vegetale di Bologna. (The wheat varieties of the Bologna Plant Breeding Institute in cultivation and under test). (pp. 323–38).*

Reference is made to the success of the wheats

Funo, Fortunato and Fiorello, which are described (cf. *PBA*, XIX, Abst. 628). In 1953 the highest yields in all Italy, with maxima of up to 76 c. per ha., were obtained from Fortunato and in 1955 it produced yields of up to 80 c. per ha.

Falchetto and four other new wheats that have not yet been named are also described (cf. Abst. 1127).

3158 *Casale, F. Tre "novità" granarie.* (*Three wheat novelties*). (*pp. 339–50*).

By crossing the variety Timilia of *Triticum durum*, which has black awns and produces dark-coloured flour, with Biancuccia, a variety free from these defects, a promising new macaroni wheat named Duro S.G.3 [Hard SG3] has been produced. It has short, strong straw, can be sown in Sicily in either spring or autumn and exceeds both parents in yield of grain, which is hard and pale in colour.

Capeiti 8 is a hybrid from Eiti 6 x Senatore Cappelli, being distinguished by short straw and very early maturity, by virtue of which it is free from lodging and escapes the effects of rusts and summer drought; it is also relatively free from mealy endosperm. It has yielded up to 31·5 c. per ha. in Sicily under conditions where the local variety Russello gave a maximum of 23 c.

Patrizio 6, also from Eiti 6 x Senatore Cappelli, resembles the foregoing in most characters but exceeds it in yield in certain areas. Both have grain of high quality.

3159 *De Cillis, U. Miglioramento genetico e novità granarie.* (*Genetic improvement and wheat novelties*). (*pp. 351–55*).

A brief outline is given of the activities of the Istituto Nazionale per la Cerealicoltura [National Institute for Cereal Cultivation] in Rome, emphasizing the extreme care that is taken to test new varieties in all important characters before allowing them to be released for cultivation. Among the promising new varieties produced by the institute the author mentions two bread wheats suitable for Sardinia and southern Italy respectively, Albimonte and F51, and a hard wheat designated Dauno III B, thought to be a natural hybrid of Dauno III.

3160 *Dionigi, A. Due nuove razze di frumento "Elia" e "Ovest".* (*Two new varieties of wheat Elia and Ovest*). (*pp. 356–65*).

The advantages of low rate of development in the winter period and rapid development in the reproductive phase are illustrated by the wheat Elia (cf. Abst. 2222), which has given good results in north, central and southern Italy, at almost all altitudes and in both late and early sowings; Ovest (cf. Abst. 254), a hybrid of Est x Virgilio, has a similar developmental rhythm and is, on account of this and its resistance to lodging, cold and rusts, a most suitable wheat for growing at the highest altitudes.

3161 *Grifoni, E. Nuovi grani per l'Italia Meridionale.* (*New wheats for southern Italy*). (*pp. 366–69*).

The variety Grifoni 235 of *Triticum durum* is proving popular in the arid areas of southern Italy, where it has produced yields varying from 28 to 59 c. per ha. when Cappelli has yielded only 18 to 31 c.

Reference is made to two other varieties of *T. durum* and two of *T. vulgare* produced by the speaker and thought to be promising for growing in southern Italy.

3162 *Trentin, A. "Leone" e "Leonardo" nuovi grani dell'Istituto di Genetica di Lonigo.* (*Leone and Leonardo, new wheats of the Lonigo Genetics Institute*). (*pp. 370–77*).

The two varieties have compared favourably in yield not only with the standards but with exceptionally good new wheats such as Funone and Produttore [Yielder]. Leone (S. Pastore x Funo 222/51) yielded 61·815 c. of grain per ha. in 1954/5 compared with 47·50 c. from Mara; it is resistant to frost, lodging and rust and free from shedding and is suitable for highly fertile land. Leonardo [Bandi x (S. Pastore x Damiano) 3780/51] yielded 53·01 c. per ha. and is also resistant to frost, lodging and rust; it is suitable for soils of medium fertility.

Both varieties have the advantage of developing slowly in the winter season and quickly at the time of ripening.

3163 *Jacometti, G. Per la valorizzazione delle spighette soprannumerarie nella spiga del grano.* (*Making use of the supernumerary spikelets in the wheat ear*). (*pp. 379–86*).

A study continued over seven years showed that in certain varieties the tendency to form supernumerary spikelets at the base of the regular spikelets was hereditary; in other varieties supernumerary spikelets appeared only occasionally. In the former group of varieties grains taken from ears with supernumerary spikelets gave rise to plants with larger numbers of florets and grains per ear than those from normal ears. The character proved recessive in crosses. A description is given of a wheat named Rosso di Salmour 44 [Salmour Red 44], obtained by pollinating Rosso aristato di Salmour [Awned Salmour Red] repeatedly with Villaglori. From Rosso di Salmour 44 a form with supernumerary spikelets along the whole length of the ear has been obtained; when sown early in autumn, in rich land, it has given yields varying from 49·50 to 62·50 c. per ha. without lodging.

3164 *De Beni, U. Le due nuove razze di grano: "R.37" e "Produttore" (S.6). [The two new varieties of wheat R37 and Produttore (S6)]. (pp. 387–96).*

R37, a winter wheat from Duecentodieci [Two Hundred and Ten] x C31, is described as resistant to spring frosts and very resistant to rust and mildew, ripening early and so escaping the effects of summer heat. In the five-year period 1951–55 it gave an average yield of 58·79 c. per ha., which is second only to Bologna, the maximum being up to 80 c. per ha.

Produttore was described in Abst. 2225.

3165 *Michahelles, M. Il nuovo frumento "Generoso". (The new wheat Generoso). (pp. 397–404).*

The parentage of this wheat (cf. *PBA*, XXV, Abst. 932) is here given as Autonomia x Mara, the latter parent being a hybrid of Autonomia x Aquila; the variety is described as being an early soft winter wheat resistant to lodging, winter cold, rusts, *Septoria* and *Erysiphe*; it is capable of yielding well under a wide range of conditions, even relatively unfavourable ones; crops of 60 c. per ha. and more are reported from several localities.

3166 *Maliani, C. I grani di Roberto Forlani. (Roberto Forlani's wheats). (pp. 412–31).*

The variety Roberto Forlani was obtained from a cross between Villa Glori and a wheat with branched ears; it is not branched but bears 6–8 florets per spikelet and an unusually large number of grains, in consequence of which it yields satisfactorily even under conditions of very low fertility. It is resistant to cold, rust, bunt, smut and mildew. In 1955 it yielded from 25·15 to 49·00 c. per ha. in the Republic of San Marino and up to 66 c. in northern Italy.

San Marino was produced from a cross of Mentana x *Aegilops ovata* and also bears an average of 2·9 grains per spikelet, some of which may contain up to 5 grains, giving an average of 50 grains per ear under normal conditions of cultivation. It is resistant to cold, drought, rust and lodging and is suitable for high ground and land of low fertility; in San Marino its yields in 1955 were from 32 to 39 c. per ha. and in the Apennines up to 40 c.

Titano is a hybrid of Villa Glori x Inallettabile 96 [Non-lodging 96] which also bears up to 5 grains per spikelet under good conditions; it is early, tillers well and is resistant to cold, rusts and lodging and fairly resistant also to drought. This wheat is also suitable for high altitudes.

All three varieties are said to develop slowly in the winter and quickly in spring.

In the discussion the merits of the Alessandro Vivenza group of wheats were confirmed, attention being drawn to their freedom from germination in the stook.

Reference was made to the wheat Loro (cf. Absts. 302–4) and to the need for further tests of its merits.

There follows an appendix in which information is given on certain other new varieties not mentioned during the session.

3167 *Gasparini, M. Nuovi frumenti per la montagna. (New wheats for the mountains). (pp. 432–36).*

Verna, a hybrid of Est Mottin 72 x Mont Calme 245, is described as a winter wheat suitable for altitudes over 650 m., very resistant to cold, rusts and soil acidity. It has yielded up to 35 c. per ha. under these conditions, this being considerably more than can be obtained from Est Mottin 72.

3168 *Michahelles, M. Il grano "Abbondanza". (The wheat Abbondanza). (p. 437).*

The wheat is stated to be a hybrid of Autonomia x Fontarronco, having shorter straw than Autonomia and being more resistant to lodging, rusts and drought; it is suitable for fairly high ground or soil of relatively low fertility.

3169 *Trentin, A. Il grano "Loro." (The wheat Loro). (pp. 438–41).*

A description is presented of Loro (cf. discussion above), with an illustration of its ear.

3170 *Agarossi, G. Il nuovo grano "Valdoria". (The new wheat Valdoria). (pp. 442–44).*

The wheat is said to be a selection from a natural cross of Damiano, which it exceeds in resistance to rust and late frosts.

3171 *Tonini, G. Il frumento "T. 53". (The wheat T53). (pp. 445–46).*

A hybrid of Damiano x Mentana, this wheat is described as early and resistant to lodging.

3172 IAZAGI, A., BOTEANU, I. & BOLDEA, E. Linii noi de perspectivă de grîu de toamnă obţinute la baza experimentală Moara Domnească, regiunea Bucureşti. (**New promising lines of winter wheat obtained at the Moara Domnească Experimental Base, in the Bucureşti region**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 655–61.

The lines referred to are ICAR 571N, 573N, 713P, 62R and 70R; they originated from the cross Tîrgu Frumos 2 x ICAR 27K (Ukrainka x A26). They outyield the standard A15 and are more resistant to yellow rust.

3173 Kiss, Á.
Genetic investigations of wheat-rye hybrids and *Triticale* No. 1 of Martonvásár.
Acta agron. 1954 : **4** : 239–78.

By means of selection in the Hungarian wheat varieties B1201, which could be fairly readily crossed with rye, and F481, which crossed less readily than B1201 but gave hybrid grains with better germinating capacity, cross fertility with rye was much improved. The F_1 hybrids were highly sterile but a low percentage of morphologically variable back crosses to wheat and rather fewer to rye were obtained, some of the wheat-like hybrids being partially fertile and all the rye-like forms completely sterile. A trihaploid hybrid resulted from crossing B1201 x Magyaróvár rye with *Triticum spelta*. By treating *T. turgidum* var. *buccale* x Magyaróvár rye with colchicine, an intermediate hybrid ($2n = 42$) carrying 28 wheat chromosomes and 14 of rye has been obtained; it has been designated Martonvásár *Triticale* xxxl. Further *Triticale* plants were procured by artificial self pollination of F_1 hybrids whose sterility was due in part to indehiscence of the anthers. Chromosome doubling occurred in the F_1 of B1201 x Kecskemét rye to give an intermediate hybrid with $2n = 56$.

Fertility of the *Triticale* hybrids increased in successive generations, cross fertility between *Triticale* strains being greater than self fertility or cross fertility with wheat or rye.

Triticale xxxl has larger grain and longer heads than either parent, is a spring form while both parents are winter forms and is completely resistant to mildew and stem rust, to both of which both parents are susceptible. Crosses of tetraploid rye with tetraploid and hexaploid wheat and with *Triticale* xxxl have been effected.

3174 Hall, O. L.
Further experiments in embryo transplantation.
Hereditas, Lund 1956 : **42** : 261–62.

As shown by earlier experiments with the spring wheat Ella, plants able to utilize rye endosperm during their early development crossed much more readily with rye than plants produced from embryos transferred to wheat endosperm (cf. *PBA*, XXV, Abst. 905). Further investigations with Ella have indicated that transplantation of embryos on to endosperms of a variety of Chinese spring wheat known to cross readily with rye also increased seed setting in wheat x rye pollination.

3175 Siclovan, V.
O nouă metodă pentru obținerea de boabe hibride între orz și grîu. (**A new method for obtaining hybrid grains between barley and wheat**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 653–54.

The technique is as follows. A wheat ovary is cut transversely and the top half, with the stigmas, after pollination with wheat pollen, is placed on damp filter paper. When the pollen tubes reach the filter paper, the top half of the wheat ovary is placed on the bottom half of a transversely cut barley ovary. The pollen tubes are stated to continue growth and enter the barley embryo-sac. Hybrids between Cenad 345 barley and Odvoș 241 wheat are said to have been obtained in this way.

3176 Hendriksen, A. J. T.
Problemen bij de instandhouding van tarwerassen in het bijzonder de Alba. (**Problems in the maintenance of wheat varieties, in particular Alba**).
StudKring. PlantVeredel., Wageningen. Versl. 1955 : **45** : 614–21.

As the result of the frontier between the Netherlands and Belgium being closed during the war years, maintenance of varietal purity in the Belgian variety Alba, at that time widely cultivated in the Netherlands, had to be carried out on Netherlands soil during the period 1940–46. Negative mass selection was found to be an unsatisfactory and cumbersome method. Intensive line selection, on the other hand, resulted not only in the maintenance of varietal purity but also in increased productivity.

3177 Fujii, T.
Mutations in Einkorn wheat induced by X-rays. I. Chlorina mutants.
Proc. Japan. Acad. 1955 : **31** : 88–92.

The X-ray induced chlorophyll deficiency *chlorina* was found to be a simply inherited recessive character. The mutant plants showed normal meiosis with 7_{11} but they were shorter, had smaller stomata and were later in heading and ripening and less fertile than normal individuals. They contained about half the normal amount of chlorophyll and showed reduced cytochrome oxidase activity.

3178 Neciporciuk [Nečiporčuk], I. D.
Experienţa îmbunătăţirii soiurilor de griu de toamnă prin educarea plantelor. **(An experiment on improving winter-wheat varieties by training the plants).**
An. Romîno-Soviet: Ser. Agric. 1955 : **24** : 44–49.

The Russian article of which the above is a Rumanian translation was summarized in *PBA*, XXV, Abst. 910.

3179 Watanabe, Y. & Mukade, K.
(Cytogenetical studies of polyploid wheats. I. Chromosome aberrations induced in X-irradiated pollen of *Triticum timopheevi*).
Senshokutai (Chromosome)/Kromosomo 1955 : Nos. 25–26 : 911–22. [Japanese].

Meiosis in *T. timopheevi* plants obtained by fertilizing normal mother plants with pollen subjected to 100–1000 r. X rays is described. The principal aberrations noted were translocations (the typical configurations being $1_{IV} + 12_{II}$) and deficiencies (the most frequent configurations being $13_{II} + 1_{I}$ and $1_{III} + 12_{II}$).

3180 Sears, E. R.
The aneuploids of common wheat.
Res. Bull. Mo. agric. Exp. Sta. 1954 : No. 572 : Pp. 58.

All of the 21 possible monosomics and trisomics and their nullisomic and tetrasomic derivatives have been obtained in Chinese Spring Wheat. On the basis of the ability of tetrasomes to compensate for nullisomes, the 21 chromosomes fall into seven homologous groups of three each (cf. *PBA*, XXIII, Abst. 1052). Most monosomics and trisomics differ little from normal plants. Nullisomics usually have distinctive morphological characteristics and show reduced vigour and fertility, but all survive to maturity and are partly fertile as male, as female or as both. Tetrasomics are fertile and generally more nearly normal than the corresponding nullisomics. On being selfed, monosomics gave 0·9–7·6% nullisomics; fertile nullisomics bred fairly true; trisomics produced 0·5–12·5% tetrasomics; and most of the tetrasomic lines were fairly constant, with 80% or more tetrasomic offspring. For each of the 21 chromosomes, a telocentric, an isochromosome or both have been obtained. The rate of transmission of monosomic isochromosomes and telocentrics is similar, on the female side, to that of the corresponding monosomics but is rather lower through the pollen. Three different chimeras found in nullisomic plants and one in a monosomic all involve duplication or loss of a complete chromosome, possibly as a result of mitotic nondisjunction. The possible methods of using aneuploids in the improvement of wheat are discussed and include the location of genes on particular chromosomes (cf. *PBA*, XXIV, Abst. 1005) and the replacement of entire chromosomes in one variety with the corresponding chromosomes from other varieties, species or genera.

3181 Priadcencu, A., Melacrinos, A., Enescu, S. & Boldea, E.
Arnăutul local de toamnă. **(The local winter form of Arnăut wheat).**
Bul. Şti. Secţ. Şti. Biol. Agron. Geol. Geogr. 1955 : **7** : 277–88.

A full morphological and agronomic description is given of a recently identified land race of *Triticum durum*. It is of the Arnăut [Albanian] type, but unlike other forms of this category, is a winter wheat.

3182 Plaut, M. & Zelzbuch, B.
The baking quality of wheat in Israel.
Ktavim, Rehovot 1955 : **4** : 63–66.

The *Triticum durum* wheats Juljuli, Nursi, Heity, Mughrabi and Giza 4 were compared with the *T. vulgare* varieties CCC, Morocco 386 and BIPM. The *T. durum* varieties were inferior in baking quality to the common wheats; the flours of the latter were equal in quality to imported flours. The *T. vulgare* and *T. durum* wheats did not however differ in total protein content or protein composition.

3183 Perjkov, V. E.
(An experiment on using fluorescent light for breeding work on wheats).
Trud. Inst. Fiziol. Rasten. K.A. Timirjazev (Proc. Timirjazev. Inst. Pl. Physiol.) 1955 : **10** : 113–21. [Russian].

Observations at Moscow on growth and development of some wheats, including hybrids bred in artificial light, are analysed. A major shortcoming of 30-watt fluorescent lamps is their low light intensity. Moreover this is further reduced by continued use after 500–700 hr. All experimental material showed a reduction in grain setting and it was found that early spring wheats, which had been given 4000 lux for each 24-hour period, set fewer grains than late varieties and had their growth periods lengthened. Great variability was observed among the spring forms of some unspecified F_3 hybrids of winter x spring wheat grown under fluorescent light.

3184 Toniolo, L.
Studio sull'accestimento di cultivar di frumento e fattori che lo influenzano. (**Study of tillering in wheat cultivars and factors which influence it**).
Ann. Sper. agr. 1956 : **10** : 669–709.

Observations made on the wheat cultivars S. Pastore, Aquila [Eagle], Damiano, Tevere [Tiber] and Mara showed, among other things, that Mara tended to produce its tillers earlier than the other varieties but its total number of tillers was the lowest; the highest was in S. Pastore and the order of the other varieties varied in the two years of the experiment.

3185 Jakovlev, A. V.
(**An experiment on growing perennial wheat in southern Kazahstan**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 20 : 6–12. [Russian].

The perennial wheat variety 2, obtained by crossing the winter wheat Lutescens 329 with *Agropyron glaucum*, proved productive when grown for forage on irrigated land at Alma-Ata. It yielded up to 141 c. forage per ha. and was hardy, notably in the first year. It showed resistance to lodging, rusts, bunt and smut.

3186 Ivanova, K.
[**A study of the quality of some Macedonian wheats (of the 1950/51 harvest)**].
God. Zborn. zemjod.-šumarsk. Fak. Univ. Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje)/Ann. Fac. Agric. Sylvicult. Univ. Skopje Zemjod. : 1951/52 : **5** : 191–205. [Macedonian].

Stara Osatka [Old Awned] and Prolifik [Prolific] from Kumanovo, Crvenka [Red] from Bitola and Osatka [Awned] and Šutarka [Ear] from Sv. Nikola were distinguished by fair grain quality among the soft wheats tested in Macedonia. The quality of all *Triticum turgidum* and *T. durum* varieties was poor, although the former produced large grain.

3187 Casale Buonoconto, B.
Caratteri chimici e fisici di alcune cultivar selezionate di frumento. (**Chemical and physical characters of some selected varieties of wheat**).
Ann. Sper. agr. 1956 : **10** : 905–21.

Flour prepared in an experimental mill from a number of Italian wheat varieties was examined in the Brabender farinograph and the Chopin alveograph; the results show that the quantity of gluten may be the same in varieties differing widely in their quality index; some of the hybrids produced at the Stazione Sperimentale di Granicoltura [Wheat Experimental Station] in Sicily have given quite high indices; these included Floran SG (from Florence x Aurore) among the bread wheats and Eiti x Cappelli E2, Aziziah x Mahmoudi 92 G and Russello 2137 among the macaroni wheats.

3188 Copp, L. G.
A small-scale quality test in wheat breeding.
Nature, Lond. 1956 : **177** : 756–57.

Zeleny's lactic-acid sedimentation test has been successfully applied at the Crop Research Division, New Zealand, in selecting individual plants for baking quality in advanced hybrid generations. Use of the test in early generations is under investigation.

3189 Fajersson, F.
Studien über die Griffigkeitszahl (Feinmehlzahl) verschiedener Weizensorten bei variierender Vermahlung. [**Studies on the grittiness value (fine flour value) of various wheat varieties subjected to different milling treatments**].
Agri hort. genet., Landskrona 1956 : **14** : 60–65.

The grittiness of fine and coarse flours of five wheats was determined (*a*) by the sieving method and (*b*) by direct observation and rubbing between the fingers. The wheats fell into two classes, good and poor, readily distinguishable by either method, but with method (*a*) the poor varieties when coarsely ground gave better (i.e. lower) values than the good wheats when finely ground, whereas with method (*b*) the finely milled good flours gave lower values than either the fine or the coarse poor flours.

3190 Sarkar, P. & Stebbins, G. L.
Morphological evidence concerning the origin of the B genome in wheat.
Amer. J. Bot. 1956 : **43** : 297–304.

"Morphological comparison between both cultivated and wild members of the *T. monococcum* (einkorn) group of wheats on the one hand and the tetraploid emmer wheats on the other, followed by the use of Anderson's method of extrapolation, indicates that the emmer wheats arose as amphiploids between the diploid einkorns and another species or species group having the following characteristics: rachis internodes long and narrow; spikelets with 3 or more florets; glumes with one inconspicuous keel, with more than 6 veins, with the tip 1-toothed, and with a thick margin; lemmas all long awned, the shoulder inconspicuously dentate or blunt; the palea not splitting at maturity; the grain large, thick, and grooved. These characters are all approached or equalled by *Aegilops speltoides* var. *ligustica*. The hypothesis is therefore advanced that the tetraploid emmer wheats evolved from amphiploids between *T. monococcum* and its relatives on the one hand and various diploids similar to *A. speltoides* on the other. The amphiploidy is believed to have occurred several times, and to have been followed by evolution on the tetraploid level which consisted of hybridization between different raw amphiploids, accompanied by chromosome rearrangements and gene mutation. In this way, it is postulated that the *monococcum* type A and the *speltoides* type S genomes became modified to form the A and B genomes of the modern emmer as well as the hexaploid wheats."

[Authors' summary].

3191 HOROVITZ, N. & HÖSS, G. V.
Observaciones sobre variedades y especies de trigo. (**Observations on varieties and species of wheat**).
Bol. Inform. Inst. Fitotec., Castelar 1954 : No. 1 : unpaginated. (Mimeographed).

Tabular data are given on the characters of a collection of 1186 wheats at the Castelar plant breeding institute in Argentina. The characters include morphological features, resistance to *Puccinia triticina*, *P. glumarum* and *P. graminis* and time of maturity.

3192 CAVALAGLIO, F.
Intorno alla valutazione delle caratteristiche ecologiche di alcune razze Italiane di frumento. (**On assessing the ecological characteristics of some Italian varieties of wheat**).
Ann. Fac. Agr. Perugia 1954 : **10** : 157–61.

Data on grain yield of ten Italian wheats show that in good seasons the formula devised by Azzi, based on rate of development, plant size and cell structure, gave a reliable prediction of their relative yields, whereas in very dry conditions the yields were determined almost exclusively by the drought resistance.

3193 LUKJJANENKO, P. P.
(**Crossing geographically distant forms in breeding winter wheats**).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 2 : 8–13. [Russian].

This account of distant crossing at Krasnodar mentions such varieties as Rannjaja 27 [Early 27] and Bezostaja 4 [Awnless 4] (cf. *PBA*, XXVI, Abst. 310). Recent achievements include Skorospelka 3b [Early 3b] and Bezostaja 4/1, the former obtained by selection from Skorospelka 3 (Kanred-Fulcaster 266287 x Klein 33) and the other from Bezostaja 4.
Skorospelka 3b outyields the initial variety and Novoukrainka 84 and surpasses these in earliness and disease resistance. Bezostaja 4/1 is free from lodging and produces 2·8–5·6 c. more grain per ha. than the initial variety.

3194 GRAHL, A.
Kälteresistenz des Weizens im Koleoptilenstadium. (**Cold resistance of wheat in the coleoptile stage**).
Landb.-Forsch., Völkenrode 1956 : **6** : 20–22.

The method described enables the cold resistance of a variety to be assessed within three weeks of germination. Seeds are germinated at room temperature and, when the coleoptiles are approximately 5 mm. long, hardened off for 3 days at a temperature of ±0° C. They are then placed in darkness and exposed to −5·7° C. of frost for 24 hrs. After being thawed out at a temperature of ±0° C. for a further 24 hrs. they are transplanted to a greenhouse with a temperature of 20° C. where frost resistance may be assessed after a further 14 days.

3195 SĂLĂGEANU, N. & GALAN, G.
Despre viscozitatea protoplasmei celulelor epidermice la unele cereale de toamnă în decrusul iernii. (**On the viscosity of the protoplasm of the epidermal cells in some winter cereals during the winter**).
Bul. Şti. Secţ. Şti. Biol. Agron. Geol. Geogr. 1955 : **7** : 5–11.

Four varieties were studied. In three, protoplasmic viscosity increased markedly during winter and decreased in spring. In the fourth, Cenad 396, there was only a slight increase during winter; this variety is not very winter-hardy.

3196 AZZI, G.
La resistenza all'allettamento e la produttività. (**Lodging resistance and yield**).
Ann. Fac. Agr. Perugia 1954 : **10** : 152–56.

Figures are presented which show that varieties such as Mentana, endowed with good standing capacity, retain their relative position in regard to yield in good and bad years. Varieties with less strong straw may yield well in good years but in seasons with heavy rainfall may prove markedly inferior to strong-strawed wheats such as Akakomugi [Red wheat] which intrinsically are not such heavy yielders. It is concluded that lodging resistance behaves as an hereditary factor distinct from the complex of other factors affecting yield.

3197 PLASMAN, A.
Note sur deux techniques d'inoculation de plantules de froment avec *Ophiobolus graminis* Sacc. et application de l'une d'elles à un test de sensibilité de lignées de froment de printemps. (**A note on two techniques of inoculating young wheat plants with *O. graminis* Sacc. and the application of one of them to a test of the susceptibility of lines of spring wheat**).
Parasitica 1954 : **10** : No. 2 : 43–50.

A method of testing wheat varieties for susceptibility to *O. graminis* by inoculating plants grown in a standardized vermiculite-gravel mixture to which a nutrient solution is added is described. A comparative trial of six spring varieties tested by this method is reported.

3198 JENSEN, N. F. & TYLER, L. J.
The direct test for dwarf bunt in wheat.
Agron. J. 1956 : **48** : 191–92.

Covering dormant wheat plants with straw after sowing in infested soil successfully increased the incidence of dwarf bunt. A comparative test of the reactions of 34 wheat lines to dwarf bunt and race 16 of common bunt indicated that resistance to common bunt may not always be a reliable indicator of resistance to dwarf bunt (cf. *PBA*, XXV, Abst. 2938), four lines uninfected by common bunt being attacked by dwarf bunt. In general, however, the two pathogens produced similar reactions.

3199 ZSCHEILE, F. P.
The influence of temperature on the expression of bunt in susceptible and resistant wheats.
Phytopathology 1956 : **46** : 168–74.

Among 26 varieties tested, the incidence of *Tilletia caries* in susceptible wheats, in three varieties carrying the Martin gene for resistance and in two resistant Turkey strains carrying the *xy* and *T* genes respectively was increased by exposure to low temperatures in the seedling stage before transplanting to the field. Low temperatures up to the time of heading resulted in the development of bunt on Baart 38 and Poso 48, both carrying the Martin gene. In genetically similar populations, incidence of bunt was greater in plants raised in the laboratory than in those grown in the field.

3200 KOVÁCS, A.
Búza-fajták kőüszögellenállósága két évi kísérletekben. (**Two years' experiments on the bunt resistance of wheat varieties**).
Növénytermelés 1955 : **4** : 225–32.

Among 42 wheats tested for two years at the Sopronhorpács Research Institute of Plant Breeding and Crop-Growing, Hungary, and 15 tested for one year, *Triticum timopheevi* was immune to *Tilletia foetida*, Oro and Nebred were highly resistant and *Triticum monococcum*, *T. dicoccum* and varieties of *T. durum* moderately resistant; Hungarian varieties were moderately susceptible. Oro and Nebred are recommended as parents in breeding for resistance. Among secondary effects caused by infection were a decrease in winter hardiness in many varieties, stimulation of tillering in 37 varieties and lengthening of the rachis in squarehead wheats and Albit.

3201 HOLTON, C. S., KENDRICK, E. L. & ELLIOTT, F. C.
Exotic sources of known types of smut resistance in wheat varieties.
Agron. J. 1956 : **48** : 243–44.

In tests of reactions to 25 races of bunt, the type of resistance known as the Ridit type, hitherto only found in varieties of *Triticum vulgare* involving the Australian wheat Florence in their pedigree, was shown by the *Triticum durum* introduction CI3255 from Tunis. Resistant to all races except T–13 and L–9, a selection of (Reliance–1018 x Mercury) x Rio displayed reaction of the Ridit type, only differing from this type by its resistance to races T–11 and L–10. The reaction of Onas, Federation and Klein Aniversario was typical of that controlled by M_2; Baart showed a weak expression of this reaction. The response of CI12204 (Reliance–1018 x Mercury) was of the Martin type (cf. *PBA*, XXI, Abst. 974).

3202 PONCHET, J.
Évolution et spécialisation du *Puccinia graminis tritici* Eriks. et Henn. en France au cours de la période 1952–1954. (**Evolution and specialization of *P. graminis* f. *tritici* Eriks. et Henn. in France during the period 1952–54**).
Ann. Inst. nat. Rech. agron., Paris : Sér. C : 1956 : **7** : 229–51.

A study of the comparative frequency of different physiological races of black stem rust of wheat in France during 1952–54 indicated that race 21 was the most common race, followed by races 17 and 14. Race 40 was the most virulent and only Einkorn and Khapli were resistant to it. In all, 18 races were identified; their geographical distribution within France is shown by means of maps and the relationship of French races to those of surrounding countries is discussed.

3203 JOHNSTON, C. O., HEWLETT, H. R. & BORLAUG, N. E.

Physiologic races of *Puccinia rubigo-vera* f. sp. *tritici* in Mexico.

Phytopathology 1956 : **46** : 137–39.

Race 11 of leaf rust was the most abundant race found among 152 collections made in Mexico over the period 1944–53, other races, in decreasing order of frequency, being 5, 105, 9, 15, 93, 37, 58, 92, 68 and 122.

3204 HAYDEN, E. B.

Pathogenicity of races 11, 15B, 49, 125, and 139 of *Puccinia graminis* var. *tritici* to new spring wheats, especially certain Kenya wheats and their derivatives.

Phytopathology 1956 : **46** : 145–50.

The four rust races 11, 49, 125 and 139, all of which are widely distributed in the USA and Mexico, were highly virulent on seedlings and adult plants of the Kenya wheats 58 and 117A and the Kenya derivatives Lerma and Kentana at both 70–75° F. and 80–85° F. in the greenhouse. Kenya 338AA1A2 and Kenya Farmer (Kenya 338AC2E2) were highly resistant to races 11, 49, 125, 139 and 15B in all tests. The reactions of Kenya 58 and 117A and of Kentana to race 15B varied with different isolates. Selkirk was resistant to 15B at temperatures below 70–72° F. but susceptible above 75° F.; it was resistant to the other races at all the temperatures tested. Willet (Frontana x Thatcher) and Sentry were susceptible to 15B and resistant to the other races at 70–85° F., Sentry showing some degree of tolerance to 15B under field conditions. The prevalence of races of the 17–29–37 complex, which attack some varieties resistant to 11, 49, 125 and 129, increased markedly in the USA and Mexico in 1954, while races 49 and 139 decreased.

3205 SHUKLA, T. N.

Factors affecting variability in cereal rust reactions. III. Variability due to age of the host.

Indian Phytopath. 1955 : **8** : 201–02.

In greenhouse experiments at Minnesota University, the wheats Lee, Stewart and Kenya 58 differed in their reaction to race 15B of *Puccinia graminis* var. *tritici* according to their age when inoculated. Lee and Stewart were highly susceptible at all ages. Six-day-old seedlings of Kenya 58 were very susceptible but this variety showed only moderate infection as the result of inoculation at the ages of 36 and 60 days.

3206 HEERMANN, R. M. & STOA, T. E.

New durum wheats resistant to 15B.

Bi-m. Bull. N. Dak. agric. Exp. Sta. 1956 : **18** : 75–81.

The varieties Langdon, Yuma, Ramsey and Towner, bred at the North Dakota Agricultural Experiment Station, are described. Langdon was developed as follows. An F_3 selection of [Ld. 194 (Mindum x Carleton)] x Khapli (*Triticum dicoccum*) was crossed with Ld. 308 [(Heiti x Stewart) x Mindum x Carleton)]. An F_2 derivative of this combination was crossed with Stewart; finally an F_1 plant from this third cross was mated with Carleton. Langdon is only moderately resistant to race 15B of stem rust but has shown a high degree of resistance to other races. Slightly earlier ripening, shorter in the straw, more resistant to lodging and less resistant to leaf rust than Mindum, it has given good yields over a wide range of localities in the state. Slightly earlier than Mindum and similar to it in straw strength, Yuma was derived from the second of the above four crosses entering into the development of Langdon. Almost equal to Khapli in resistance to race 15B and highly resistent to shattering, it is superior in yield to Mindum when stem rust is sufficiently severe to damage this variety. In Ramsey and Towner, both derived from Carleton x Palestine introduction PI94701, resistance to 15B is expressed in the very small size of the pustules formed and decreases at higher temperatures. Both varieties mature at about the same time as Mindum, Ramsey being slightly more resistant to lodging than this variety. Ramsey is widely adapted in the state; Towner does best in the northern part.

3207 STOA, T. E., HEERMANN, R. M. & STURLAUGSON, V.

Intensive seed increase program hastened release of new durums.

Bi-m. Bull. N. Dak. agric. Exp. Sta. 1956 : **18** : 82–87.

An account is given of some aspects of the development of varieties resistant to race 15B of stem rust, using Khapli and a Palestine introduction as sources of resistance (cf. Abst. 3206). The time ordinarily required for breeding was curtailed to five years by the propagation and testing of early generations in the greenhouse during winter in North Dakota and by seed increase of selections in autumn sowings in Arizona or California. Preliminary increase of F_4 selections provided, without delay, material for extensive testing and the basis of seed supplies of the lines eventually chosen for commercial release.

3208 SIBBITT, L. D., SCOTT, G. M. & HARRIS, R. H.
Milling and macaroni-making quality of 4 new durums.
Bi-m. Bull. N. Dak. agric. Exp. Sta. 1956: **18** : 88–92.

The results of tests of the new varieties Langdon, Yuma, Ramsey and Towner in comparison with Mindum, Vernum and Sentry are reported (cf. Abst. 3206). The new wheats showed satisfactory milling and macaroni-making properties, with superiority over Mindum in protein contents of the grain and semolina and in yield of semolina.

3209 OORT, A. J. P.
Verspreiding en verwantschap van physiologische rassen van gele roest (*Puccinia glumarum*) van tarwe in Europa.
[**Distribution and interrelationship of physiological races of yellow rust (*P. glumarum*) of wheat in Europe**].
Tijdschr. PlZiekt. 1955 : **61** : 202–19.

The literature on the occurrence and geographical distribution of physiological races of yellow rust of wheat in Europe is discussed with particular reference to the relationship between different races, the development of new races by mutation and factors, such as varieties grown and climatic conditions, that limit a particular race to a given geographical area. Physiological races are divided into two main categories, those that occur over a wide area and local races. Tables are provided indicating the distribution areas of the principal races in the former category.

3210 HORBER, E.
Die gelbe Getreidehalmfliege (*Chlorops pumilionis* Bjerk.), ein Schädling an Weizen und Gerste.
[**The yellow gout fly (*Ch. pumilionis* Bjerk.), a pest of wheat and barley**].
Mitt. schweiz. Landw. 1956 : **4** : 89–92.

Varietal differences in susceptibility to the above insect are noted. Observations made at the Federal Agricultural Research Station, Zürich-Oerlikon, Switzerland, indicated that varieties with an initially rapid rate of growth are less susceptible than those that grow slowly. The spring wheat Huron, the winter wheat Probus, the spring barleys Kenia, Isaria, Herta and Freja and the winter barleys Riniker, Bordia and Dea suffered relatively little damage.

BUCKWHEAT

3211 SANDO, W. J.
Buckwheat culture.
Fmrs' Bull. U.S. Dep. Agric. 1956 : No. 2095 : Pp. 23.

The bulletin includes an account of varieties grown in the USA, mention being made of the new variety Tetratataricum, a tetraploid form developed from *Fagopyrum tataricum* by colchicine treatment. Although not yet in commercial use, preliminary tests have shown the tetraploid to be superior to other buckwheats in rutin content. Compared with Tartary, Tetratataricum has thicker stems and leaves, shorter internodes, and larger leaves, flowers, pollen grains and seeds. Maturing about a week later than Tartary, it produces fewer seeds. Tetratataricum does not cross with other buckwheats, except possibly Tartary.

OATS

3212 WATERSON, H. A.
Oat variety recommendations.
Adv. Leafl. W. Scot. agric. Coll. 1956 : No. 45 : unpaginated.

Information is given on varieties recommended for soils with different levels of fertility in the west of Scotland.

3213 **Small grain varieties for Indiana.**
Sta. Circ. Ind. agric. Exp. Sta. 1956 : No. 417 : Pp. 6.

Of the varieties briefly described, two spring oat varieties, Newton and Bentland, are new. Bentland is a Benton type with crown-rust resistance and is expected to replace Benton. Newton has medium height, stiff straw, smut resistance and the same time of maturity as Clintland. Like Missouri 0–205, it is moderately resistant to crown rust and resistant to race 7 and related forms of stem rust but susceptible to race 8 and related forms.

3214 SIMS, H. J.
New oat—Alpha provides more early grazing.
J. Dep. Agric. Vict. 1956 : **54** : 116–17.

Alpha was developed at the Mallee Research Station, Walpeup, Victoria, from a single-plant selection, probably a natural hybrid of Burke x Mulga. It is recommended only as a grazing oat, particularly for the production of early forage.

3215 Brown, C. W.
Oat and barley varieties.
Agric. Gaz. NSW 1956 : **47** : 24–25, 51–52.

Descriptions are given of the following oat varieties recommended for New South Wales: Acacia, Algerian, Ballidu, Belan, Buddah, Burke, Dale, Fulghum, Lampton and Orient. Suitable barley varieties are listed only.

3216 Jones, E. T.
The origin, breeding and selection of oats.
Agric. Rev., Lond. 1956 : **2** : No. 1 : 20–28.

In this popular article the author discusses the evolution of *Avena* spp. and methods and problems of oat breeding in general.

3217 Nieuw haverras Civena voldoet in de praktijk uitstekend. (**The new oat variety Civena gives an excellent performance in practice**).
Boer en Tuinder 1956 : **10** : p. 3.

The new yellow-grained variety Civena, from the cross Adelaar x Carstens Gelbe [Carsten's Yellow] is described (cf. Abst. 1204). In recent trials it did well on all types of soil in the Netherlands and proved extremely resistant to lodging.

3218 Brown, C. M., Pendleton, J. W., Bever, W. M., Bonnett, O. T. & McKibben, G. E.
Spring oat varieties for Illinois.
Circ. Ill. agric. Exp. Sta. 1956 : No. 754 : Pp. 16.

Information is given on the performance of 36 varieties tested in several localities in Illinois during 1950–55. The list of recommendations includes the following newer varieties released in the USA: Branch (cf. *PBA*, XXII, Abst. 308) from (Forward x Victoria-Richland) x Forward; Sauk (cf. *PBA*, XXIII, Abst. 1904) from (Forward x Victoria-Richland) x Andrew; Clarion and Wanbay (cf. Abst. 362), both from Clinton x Marion; Newton and Bentland (cf. Abst. 2254), respectively developed from Nemaha x (Clinton x Boone-Cartier) and Benton x Landhafer back-crossed six times to Benton; and Logan (Benton x Marion). The last-mentioned variety, released by the Illinois Agricultural Experiment Station, has equalled Clinton and Andrew in yield. It is resistant to race 7 of stem rust but susceptible to race 8 of this rust, race 202 of crown rust and *Septoria* black stem. It ripens several days earlier than Clinton and has a very low percentage of hull.

3219 Sappenfield, W. P.
The inheritance of earliness among six common varieties of oats.
Res. Bull. Mo. agric. Exp. Sta. 1952: No. 514 : Pp. 55.

This is a detailed account of work reported in *PBA*, XXIII, Abst. 1900.

3220 Coffman, F. A.
Bagging possibly reduces success in oat crossing.
Agron. J. 1956 : **48** : p. 191.

In an experiment conducted at Aberdeen, Idaho, in 1955, seed set was 23·3% when panicles were bagged after hand pollination but was 27·3% when the panicles remained unbagged. It is not known whether the greater seed set of the unbagged panicles resulted from fertilization by stray pollen, but it is thought that bagging may have reduced seed set by causing unfavourably high temperatures within the bags.

3221 Nishiyama, I. & Iizuka, M.
(**Results of using X-irradiated pollen in incompatible crosses**).
Kyoto Dagaku Shokuryo Kagaku Kenkyusho Hokoku/Bull. Res. Inst. Fd. Sci. Kyoto Univ. 1952 : No. 8 : 81–89. [Japanese].

X-irradiated pollen was used in an attempt to set seed in some otherwise incompatible interspecific crosses in *Avena* and *Triticum*. Two hybrids were obtained using this technique: *A. strigosa* ♀ x *A. barbata* ♂ and *A. strigosa* ♀ x *A. sativa* ♂. The hybrids resembled the reciprocals described earlier by the author (cf. *PBA*, III, Abst. 204).

3222 Zillinsky, F. J.
Cross compatibility relationships among some *Avena* species and polyploids.
Canad. J. agric. Sci. 1956 : **36** : 107–13.

This is an extended account of work reported in *PBA*, XXV, Abst. 1756.

3223 Nishiyama, I.
Cytogenetic studies in *Avena*, V. Genetic studies of steriloids found in the progeny of a triploid *Avena* hybrid.
Mem. Res. Inst. Fd. Sci. Kyoto Univ. 1953 : No. 5 : 14–24.

The present paper of this series (cf. *PBA*, XXI, Abst. 988) gives further information on the genetics of steriloids (cf. *PBA*, V, Abst. 346 and XXIII, Abst. 2369), the plants described being 28-chromosome F_3 segregates of *A. barbata* x *A. strigosa*. The steriloids gave rise to articulate and steriloid offspring in the ratio 1·08 : 1;

a small proportion of plants with solid spikelet-bases also appeared. The articulate and solid-based segregates bred true; the steriloids continued to segregate. It is considered probable that the steriloids arose as a consequence of a chromosome aberration.

3224 Wiggans, S. C. & Frey, K. J.
Photoperiodism in oats.
Proc. Iowa Acad. Sci. 1955 : **62** : 125–30.

Data on the reactions of five varieties to different photoperiodic treatments are presented. By using photoperiods of 18–24 hr. and a temperature of 70° F., it is possible to produce four generations in one year, a technique which is proving useful in breeding.

3225 Brown, C. M. & Shands, H. L.
Factors influencing seed set of oat crosses.
Agron. J. 1956 : **48** : 173–77.

Seed set after artificial cross pollination was generally lower than after natural pollination and was found to be influenced by (1) the experience of the workers performing the pollination, (2) quality of the pollen, poor set often being due to the use of immature pollen, (3) stigma receptivity, the best time being 1–3 days after emasculation and (4) temperature, high temperatures at the time of emasculation, pollination or the intervening days being detrimental to seed set.

3226 Nishiyama, I.
(**Gene analysis of spikelet type in oats utilizing monosomic inheritance**).
Kyoto Dagaku Shokuryo Kagaku Kenkyusho Hokoku/Bull. Res. Inst. Fd. Sci. Kyoto Univ. 1951 : No. 4 : 67–85. [Japanese].

A genetic study of progenies of crosses between *Avena fatua*, *A. sterilis*, and *A. nuda*, on the one hand, and a 41-chromosome B fatuoid from *A. sativa* 'Aurora', on the other, is reported. All these crosses give F_1 hybrids with either 41 or 42 chromosomes; the studies reported here refer to the 41-chromosome hybrids and their progenies. The $2n$–2c nullisomics from *A. fatua* and *A. sterilis* had fatuoid spikelets. The $2n$–c^n nullisomics from *A. nuda* gave rise to 41-chromosome offspring with either naked or solid spikelets and to 40-chromosome offspring with either fatuoid or naked spikelets.

Crosses were also made between *A. sativa* and *A. nuda* and between *A. nuda* and *A. fatua*. In the F_2 of the latter, the segregation ratio for spikelet type was 12 naked : 3 solid : 1 fatuoid. These data can be accounted for if the species have the following genotypes: *A. fatua*, $+^s$ on chromosome c^f, $+^{Nu}$ on a or b; *A. sativa*, *S* on c^s or c^n, $+^{Nu}$ on a or b; *A. sterilis*, S^{st} on c^{st}, $+^{Nu}$ on a or b; and *A. nuda*, *S* on c^s or c^n, *Nu* on a^n or b^n.

Chromosome c^f affects the development of hairs on the glume of the first grain, and, to a lesser extent, of the glume of the second grain.

3227 Lindsay, D. R.
Progress report—wild oats—taxonomic and genetic studies.
Proc. 9th mtg. West. Sect. nat. Weed Comm., Regina, Sask. 1955 (1956) : p. 35.

Avena fatua has been classified into vars. *intermedia*, *vilis*, *pilosissima* and *glabrata*.

3228 Rybakova, M. I.
(**Studying the effect of different light conditions upon development and growth of oats in connexion with their geographical origin**).
Trud. Inst. Fiziol. Rasten. K.A. Timirjazev (Proc. Timirjazev. Inst. Pl. Physiol.) 1955 : **10** : 286–98. [Russian].

Photoperiods of 9 hr. under Moscow conditions retarded growth and the development of the reproductive organs. The effects of short day were more noticeable when the plants were deprived of natural light in the morning and evening (treatment II) than at other times (treatment I). Each photoperiodic treatment had a definite effect upon panicle formation; the plants in treatment I had compact and productive panicles, the others had a lax panicle with a reduced number of spikelets.

The effects of photoperiodic treatments varied with geographical origin of the variety. For instance, the oat Soviet, which is referred to as a North Caucasian ecotype, started developing before the varieties from central and northern Russia with treatment I. It developed more quickly with treatment I than with treatment II. The winter oat Kabardinec, a Mediterranean ecotype, responded sharply to treatment, especially treatment II, by not beginning the formation of the reproductive organs till the end of the summer.

3229 Amirshahi, M. C. & Patterson, F. L.
Development of a standard artificial freezing technique for evaluating cold resistance of oats.
Agron. J. 1956 : **48** : 181–84.

A satisfactory method of testing oats for cold resistance involved growing the seedlings at 65°–70° F. in unfertilized soil in the greenhouse for 31 days, hardening at 34° F. for 24 hours, cold treatment at 18° F. for 12 hours, thawing at 36° F. for 12 hours and recovery at 65°–70° F. for 7–10 days. Very high soil moisture content was used during hardening and cold treatment.

3230 Amirshahi, M. C. & Patterson, F. L.
Cold resistance of parent varieties, F_2 populations and F_3 lines of 20 oat crosses.
Agron. J. 1956 : **48** : 184–88.

Cold resistance in parental lines and F_2 and F_3 populations of 20 crosses among six hardy, one intermediate and two spring varieties was studied by the method described in Abst. 3229. In most crosses average survival in the F_2 and F_3 was near the mean parent value and distribution of survival values in the F_3 was close to normal, suggesting that cold resistance was determined by multiple genes with an additive effect. Heritability of cold resistance, calculated as the ratio of genetic variance to phenotypic variance, ranged from 0·18 to 0·95 with an average of 0·70 for the 20 crosses. Procumbent plants tended to be more cold resistant and earlier in heading when planted in spring than upright types, but the correlations were not close in the F_2 and F_3 generation. Thirteen of the crosses yielded F_3 lines exceeding the very hardy variety Wintok in cold resistance, crosses between Wintok and hardy varieties yielding the highest proportion of promising F_3 lines.

3231 Turner, E. M.
A fungicide produced by oats, and its relation to resistance of oats to take-all.
Ann. appl. Biol. 1956 : **44** : p. 200.

A thermostable, methanol-soluble substance obtained from sap expressed from leaves of oat seedlings was able to inhibit the growth of both *Ophiobolus graminis* and *O. graminis* var. *avenae* in a synthetic medium. Other fungi were also sensitive. *O. graminis* var. *avenae* grew well in sap expressed from the roots while *O. graminis* was killed. There is evidence that the same toxic substance is present in both leaves and roots and it is thought, since both the pathogen varieties are similarly inhibited by the partially purified substance, that the concentration in the roots is low and that other substances may be present in the sap which allow var. *avenae* to overcome the inhibitory effect.

3232 Moule, C.
La résistance des variétés d'avoine à la rouille couronnée (*P. coronata avenae* Pers.). [**The resistance of oat varieties to crown rust (*P. coronata avenae* Pers.)**].
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1955 : **5** : 639–62.

After discussing the geographical distribution of physiological races of *Puccinia coronata* f. *avenae* in France and the literature on the genetical basis of resistance to this pathogen the author presents the results of recent trials at the Central Station of Genetics and Plant Breeding, Versailles. None of the French varieties tested proved highly resistant although some were considerably less susceptible than others. Of 20 American varieties investigated, 5 proved highly resistant. Two of these American varieties, Bonham and Garry, which possess the Bond and Victoria types of resistance respectively, are also resistant to *P. graminis* and will be used in future breeding at Versailles for combined resistance to both rusts.

3233 Simons, M. D. & Murphy, H. C.
Inheritance of resistance to two races of *Puccinia coronata* Cda. var. *avenae* Fraser and Led.
Proc. Iowa Acad. Sci. 1954 : **61** : 170–76.

The inheritance of resistance was studied in F_2 progenies from crosses involving the resistant oat varieties Landhafer, Santa Fe and Trispernia. The resistance of Landhafer to race 101, as determined from four crosses, was conditioned by a single partially dominant gene. Data from two crosses were in accordance with the hypothesis that the resistance of Santa Fe to races 45 and 101 is dependent upon two linked genes with a recombination value of about 23%. The resistance of Trispernia, studied in one cross, could be attributed to the action of a single gene. Crosses involving Landhafer on the one hand and Trispernia and Santa Fe on the other indicated that the effects of the different resistance genes were cumulative.

3234 Konzak, C. F.
A note on the use of radiation for the production of mutations for Victoria-blight resistance in oats.
Phytopathology 1956 : **46** : 177–78.

Blight-resistant mutants in Tama, Park and Victoria, induced by exposure to X rays, fast neutrons and thermal neutrons, were found to vary in reaction to crown rust, most being susceptible. The two mutants with the greatest resistance to crown rust (cf. Abst. 1042) were almost completely sterile. It is thought that the crown-rust resistance may be determined by a genetically complex locus or a number of pseudoalleles.

3235 Cameron, D.
Breeding better cereals. Work at the Scottish Plant Breeding Station.
Scot. Agric. 1956 : **35** : 183–86.

Oat, wheat and barley breeding for Scottish conditions is reviewed (cf. Abst. 111).

In oat breeding, work has recently been initiated on resistance to tulip root (*Ditylenchus dipsaci*). Two further varieties of oats, Albyn Empress and Albyn Bard, were named in January 1956. The former is an early-ripening stiff-strawed oat giving high yields on heavy land, the latter an improvement on Bell for the crofting areas of the west coast.

RYE

3236 Rajki, S.
A vitalitás fokozásának módszerei rozsnál. (**Methods of increasing vitality in rye**).
Növénytermelés 1955 : **4** : 193–212.

Self pollination resulted in 10–25 times lower seed setting than intravarietal crossing and the progeny remained less productive even after two generations of subsequent open pollination. The presence of wheat pollen during selfing increased seed setting 1·5–3·5 times. After intraclonal pollination between plants raised under different conditions, seed set was 2–8 times greater than that resulting from selfing; the second generation of such intraclonal crosses was 9·8% less productive than the equivalent generation of intravarietal crosses. The highest seed set occurred in intervarietal crosses, and their F_1 and F_2 generations were superior in all characteristics investigated to the equivalent generations obtained through selfing, intraclonal pollination or intravarietal crossing.

3237 Pastušenko-Strelec, N. A.
(**Intraclonal pollination of rye and of kok-saghyz**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 98–129. [Russian].

At the Institute of Genetics, the rye Vjatka was divided into clones and the plants of each were intraclonally pollinated. They set more grains per plant than material selfed in the normal way and gave progenies showing no reduction in vitality or other ill effects of inbreeding. The plants in a clone and the progenies from intraclonal crossing were uniform morphologically. Analogous results were obtained in experiments on intraclonal pollination of *Taraxacum kok-saghyz*.

3238 Poos, J. A. J.
The breeding of a winter rye variety with a good eelworm-resistance.
Euphytica, Wageningen 1956 : **5** : 33–40.

The stiff-strawed rye CIV44/36 was developed at the Heertveld farm of the CIV Plant Breeding Station, Vieghel, Netherlands, from Ottersum x Petkus back crossed to Petkus. In laboratory tests for resistance to *Ditylenchus dipsaci*, 25% of the plants were free from damage, 50% were slightly infected and 25% were heavily attacked; in the field, however, only 10% were damaged and the remaining plants covered the ground well. Selection for yield, which at present approaches that of Petkus on uninfected soils, and for other desirable characters is continuing.

MAIZE

3239 Lanza, F.
Moderni aspetti di maiscoltura. (**Modern aspects of maize growing**).
Maydica, Bergamo 1956 : **1** : 36–47.

Some guidance is offered to maize growers concerning the maturity rating of the maize varieties to choose for different parts of Italy and for different conditions, together with advice on cultural measures.

3240 Avakjan, A. A.
(**Breeding varieties of maize for districts new to its cultivation**).
Agrobiologija (Agrobiology) 1956 : No. 1: 28–37. [Russian].

This report describes the Mičurinist basis of breeding work on maize at Gorki Leninskie and mentions a white dent, a yellow dent and a yellow flint, notable for hardiness, short growth period and good yields of forage and grain in the Nonchernozem Belt. They were obtained by continuous selection among hybrids between vigorous southern varieties originating from North Osetia and early-ripening varieties from Čišmy, Kazanj and Slavgorod. Reference is made to a hybrid from Lednice, Czechoslovakia, which has been tested at Gorki Leninskie. It combines earliness and vigour and produces 15 metric tons of grain and 40 tons of forage per ha.

3241 Avakjan, A. A.
(**Breeding varieties of maize for districts new to its cultivation**).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 2 : 3–7. [Russian].

The article is substantially the same as that referred to in Abst. 3240.

3242 Buzulin, G. S.
(What the trial of new varieties showed).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. **3** : 17–18. [Russian].

Late maize varieties and hybrids producing large amounts of forage and the best early grain types in the Tambov province are listed. Among the latter Bukovina 2, Kremnistaja 234 [Flint 234] and Hybrids 1 and 2 from the Volčansk Varietal Field Station yielded the most grain. Mention is made of work on intervarietal hybrids at Mičurinsk, where Sterling x Harjkov 23 and Minnesota x Partisan showed a high degree of heterosis for yield and ear size.

3243 Musiĭko, A. S.
(For wider introduction of the new maize variety Odessa 10).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 3 : 10–15. [Russian].

The results of the 1955 trials of Odessa 10, previously described in *PBA*, XXV, Abst. 1036, are reported. It produced larger amounts of forage and grain than VIR 42 [Institute of Plant Industry 42] in many Ukrainian districts and also in the Crimea and Moldavia.

3244 Meteljskiĭ, V. V. & Beselj, Ja. Ė.
(Problems of agricultural methods for maize in the Kemerovo province).
Zemledelie (Agriculture) 1956 : No. 2 : 39–44. [Russian].

In trials at Kemerovo, Slavgorodskaja Mestnaja [Local Slavgorod] outyielded all other early varieties. Voronež 76 and Bukovina 1 were the most productive midseason types. Late varieties such as Sterling and Krasnodar 1/49 yielded up to 400 c. forage per ha., but no grain.

3245 Grodskiĭ, M. V. & Sidorovič, O. N.
(Maize growing in the White Russian SSR).
Zemledelie (Agriculture) 1956 : No. 2 : 45–48. [Russian].

In the 1955 trials in Minsk province, Kremnistaja Skorospelaja [Early Flint] produced higher forage and grain yields than all other varieties. Next came Sterling and a local selection, followed by Partisan.

3246 Velican, V.
Soiul de porumb "Arieșan". **(The maize variety Arieşan).**
Anal. Inst. Cerc. agron. Român. 1954 : **21** : No. 2 : 57–64.

The above variety was obtained by crossing lines extracted from the varieties Galben timpuriu [Early Yellow] and Românesc de Studina [Studina Rumanian]. It outyielded Portocaliu [Orange] at Câmpia Turzii by 27·2%; the vegetative period is 137 days.

3247 Brooks, J. S. & Pass, H.
Performance tests of corn varieties and hybrids, 1955.
Misc. Publ. Okla. agric. Exp. Sta. 1956 : No. MP-44 : unpaginated.

The results of eight trials of experimental and commercial hybrids of maize in Oklahoma are tabulated. Reid Yellow Dent was the only open-pollinated variety included.

3248 Crane, P. L., Newman, J. E. & Miles, S. R.
Performance of dent corn hybrids in Indiana, 1951–1955.
Sta. Bull. Ind. agric. Exp. Sta. 1955 : No. 634 : Pp. 16.

Information is given on the performance of open-pedigree and privately controlled hybrids of maize tested in nine localities in Oklahoma.

3249 Kratochvil, D. E. & Shank, D. B.
South Dakota corn performance tests, 1954.
Circ. S. Dak. agric. Exp. Sta. 1955 : No. 112 : Pp. 23.

The results of yield trials carried out on commercial hybrids and varieties of maize at several localities are summarized.

3250 Brink, R. A.
Effect on endosperm phenotype in maize of heterozygosity at the R locus in the staminate parent.
Science 1956 : **123** : p. 672. (Abst.).

"Normally, the gametes A and A′ arising from an AA′ individual, considered as a generalized monofactorial heterozygote, are precisely equivalent in their effects on the offspring to the corresponding gametes formed by the respective homozygotes, AA and A′A′. This rule was found not to hold in maize test-crosses involving an R allele (self-colored aleurone) and R^{st} (stippled aleurone).

"A single RR^{st} plant, in a relatively uniform inbred strain, was self-pollinated. Pollen of the three classes of offspring, RR, RR^{st}, and $R^{st}R^{st}$ (distinguishable also by anther color) was placed on a highly inbred rr (colorless aleurone) stock. A determinate area of aleurone on each kernel then was scored quantitatively for pigmentation. Modal color grades (scale

0–100) of the kernels on representative ears from the rr ♀ x RR ♂ and rr ♀ x $R^{st}R^{st}$ ♂ matings were 98 and 23, respectively. The rr ♀ x RR^{st} ♂ testcross gave a bimodal distribution with well-defined peaks at 3 and 18–23.

"Verification of kernel genotype in the latter testcross requires a progeny test. It is obvious, however, that the score (3) for one kernel class, at least, derived from the heterozygote differs greatly from the value for the corresponding homozygote. Since the RR and $R^{st}R^{st}$ genotypes tested were offspring of a selfed RR^{st} plant, the change in endosperm phenotype associated with the heterozygosity appears to be transitory."

[Author's summary].

3251 STADLER, L. J. & EMMERLING, M. H.
Relation of unequal crossing over to the inter-independence of R^r elements (P) and (S).
Genetics 1956 : **41** : 124–37.

A detailed account is given of the analysis already referred to in *PBA*, XXIV, Abst. 2896.

3252 ARNOŠT, R. & VOLPRECHT, J.
Výroba heterosního osiva kukuřice v JZD. (**Production of hybrid maize seed on cooperative farms**).
Za socialist. Zeměd. 1956 : **6** : 584–87.

In recent Czechoslovakian trials the line-hybrid Lednický Raný [Early Lednice] has outyielded all early maizes and Lednický Středně Pozdní [Lednice Midseason] all the late forms. Among the intervarietal hybrids listed, those between Ločovce and Trebišov, on the one hand, and Český Bílý Koňský Zub [Czech White Dent], on the other are notable for their earliness. Hybrids of Bučianský Koňský Zub [Bučiany Dent] and Bučianská Žltá [Bučiany Yellow] with T52 are specially suitable for cultivation in warmer districts. The remaining hybrids are productive late types.

3253 BRANDOLINI, A.
Una varietà sintetica per la coltura estivo-autunnale dopo frumento: il sintetico Zanchi. (**Zanchi synthetic, a synthetic variety for summer-autumn growing after wheat**).
Maydica, Bergamo 1956 : **1** : 48–56.

The reasons for the diversity of opinions regarding the best number of lines to use in a synthetic variety are analysed. The synthetic variety described was constituted from 11 selected lines from the third generation of selfing of the popular Italian flint variety Sacra Famiglia [Holy Family]. In 1954, under very unfavourable conditions, the synthetic yielded 27% more grain than the original variety, the grain attaining moreover a better state of maturity. The synthetic was more resistant to fungal attack. Sown in late June after a wheat crop it gave a yield of 39·0 c. per ha. as compared with 35·8 c. for Wisconsin 355 and 35·9 c. for Marano, a variety commonly used in Italy for summer planting.

F_2 populations from Zanchi were almost indistinguishable from the original hybrid in all respects.

3254 DI MARTINO, V.
I granturchi ibridi nella zona collinare del Garda. (**Hybrid maize in the hill zone of Garda**).
Agric. bresciano 1956 : **4** : No. 18 : p. 2.

Whereas the old open-pollinated varieties produced an annual grain yield of 40 c. per ha. in the high lands round Lake Garda, early-maturing hybrids yielded up to 70–75 c. per ha. in 1955.

3255 FENAROLI, L.
Sementi di mais. (**Maize seed**).
Sementi elette 1956 : **2** : No. **4** : 14–19.

The advantages of using first-generation hybrid seed are emphasized. In Italy important considerations in choosing a variety are time of maturity and type and colour of grain and a list of recommended hybrids with maturity ratings varying from 200 to 900 is presented.

3256 Milhos híbridos. Campanha de 1954. (**Hybrid maize. 1954 season**).
Estud. Inform. téc. Direcç. ger. Serv. agríc., Lisboa 1956 : No. 41 : Pp. 21.

An account is given of the system of testing maize hybrids in Portugal and the results for 1954 are presented, showing the clear superiority of hybrids such as Irpal 342, Wisconsin 641AA, US13 and Ohio M13 over local varieties.

3257 BALJURA, V. I. & ŠOSTAK, O. F.
(**Hybrid seed**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 3 : 7–9. [Russian].

This report on maize breeding at the Cereal Institute mentions some hybrids that are productive of forage and grain in the Nonchernozem Belt. Most are hybrids between early-maturing Siberian varieties and late south-Russian varieties. Data on the yields of the F_1 and F_2 of Slavgorod 270 x Partisan, Minusinka [Minusinsk] x Partisan and Minusinka x Minnesota 13 Extra are presented.

3258 **(Measures for a switch-over of collective and state farms to the sowing of hybrid seed).**
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 5 : p. 12. [Russian].
(USSR conference concerning the production of hybrid maize seed).
Ibid 1956 : No. 5 : p. 13. [Russian].

The first article reports the details of a decree of the USSR Ministry of Agriculture recommending the production of hybrid maize seed. The other gives an account of a conference held at Dnepropetrovsk, where the proposed administrative measures and related topics were discussed.

3259 MIRJUTA, JU. P.
(A few remarks on the model scheme of seed production for double-cross interline hybrids).
Zemledelie (Agriculture) 1956 : No. 1 : 125–27. [Russian].

Minor changes in the instructions, issued in 1955 by the USSR Ministry of Agriculture on the production of hybrid maize seed, are proposed and a modified scheme incorporating the changes is submitted.

3260 PRJADČENKU [PRIADCENCU], A.
(Varieties and intervarietal hybrids of maize in Rumania).
Agrobiologija (Agrobiology) 1956 : No. 1 : 38–39. [Russian].

The principal maize standards for various districts, comprising late dents, early-maturing and midseason flints and some dent x flint populations, are described. Most are yellow or orange-grained forms and some show resistance to drought. Recently they have been superseded as standards by a number of intervarietal hybrids, mainly dent x flint or flint x flint combinations which outyield them by 12–15% and show greater earliness. For instance, Lester Fister* x Studina was made a standard in the moist western plain and ICAR 54 x Studina in the arid southern districts. Hybrids Dobrogea x ICAR 54, Tîrgu Frumos x Lester Fister, Željtyĭ Ranniĭ [Early Yellow] x Oranževyĭ [Orange] and Željtyĭ Ranniĭ x Arieşan have been specially bred for the Bărăgan steppe, Transylvania, the north-eastern and the north-western districts respectively. (Cf. Abst. 2295)

3261 GRILLOT, M. G.
L'amélioration du maïs et le perfectionnement de sa culture au Maroc. **(Maize breeding and the improvement of its cultivation in Morocco).**
CR Acad. Agric. Fr. 1956 : **42** : 85–94.

A review is presented of recent advances in maize cultivation, selection and breeding in Morocco. Research has included the testing of North American hybrids, the development of Moroccan hybrids for irrigated and non-irrigated conditions at the Rabat station and other experimental centres and agronomic studies of successive hybrid generations. Work is proceeding on the development of three categories of double hybrids: an early-maturing, white-grained type for cultivation under non-irrigated conditions; a mid-early, yellow-grained type for either irrigated or nonirrigated conditions; and a late-maturing, white-grained dent type with heavy yields that is to be grown solely under irrigation.

3262 **Hybrid corn in Tennessee.**
Sth. Seedsman 1956 : **19** : No. 3 : 42–43.

Of 18 varieties tested by Tennessee agricultural experiment stations over the period 1953–55, the white-grained hybrid Tenn. 29 gave the highest yields and proved well adapted to mechanical picking.

3263 JUGENHEIMER, R. W. & TROYER, A. F.
Experimental corn hybrids tested in 1955.
Bull. Ill. agric. Exp. Sta. 1956 : No. 597 : Pp. 32.

Tables are given summarizing the results of tests of many experimental double, three-way and single crosses of maize with respect to yield and other agronomic characters at four centres in Illinois in 1955, together with the average results for tests carried out during 1951–55.

3264 LENG, E. R. & KOEHLER, B.
1955 Illinois corn tests.
Bull. Ill. agric. Exp. Sta. 1956 : No. 598 : Pp. 29.

The results of trials carried out in several localities in Illinois during 1955 to evaluate commercial hybrids and a number of experimental entries with respect to yield, moisture percentage at harvest and other characters are summarized. The average results for the period of 1953–55 are included.

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* ? Pfister.

3265 Bocanegra S., S.
Rendimiento de los híbridos de maíz en los valles de Virú y Casma. (**Yield of maize hybrids in the Virú and Casma valleys**).
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 341 : 6–11. (Mimeographed).

The varieties usually sown in these Peruvian valleys produce 1500 to 2000 kg. of grain per ha. and figures are presented showing that some of the double-cross hybrids yield up to 60% more than this in the Virú and 39% in the Casma valley.

3266 Bocanegra S., S.
Resultados obtenidos en el programa de maíz en la Estación Experimental Agrícola de "La Molina."—Campanã 1954–55. (**Results obtained in the maize programme of the La Molina Experimental Station. Season 1954-55**).
Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 342 : 20–33. (Mimeographed).

A new group of inbreds of superior agronomic qualities and combining ability has been selected. Single and double-cross hybrids are being tested in different areas of Peru and some of them have given yield increases of up to 25% over the local standard Colombiano Fumagalli.

3267 Andrew, R. H., Ferwerda, F. P. & Strommen, A. M.
Maturation and yield of corn as influenced by climate and production technique.
Agron. J. 1956 : **48** : 231–36.

A comparison is made between the performances of maize hybrids at Wageningen, Netherlands, and Spooner, Wis., with particular reference to W240 and W255, which have given substantially higher yields of grain in the Netherlands. On the average W240 has produced 62·9 bushels per acre at Spooner and 86·1 at Wageningen, while W255 has yielded 63·3 bushels at Spooner and 95·9 at Wageningen. Factors contributing to their better performance in the Netherlands include higher plant populations, more uniform distribution of rainfall, higher soil fertility and lower incidence of disease. Comparable stages of maturity require up to nine more weeks in the growing season at Wageningen than at Spooner. The number of heat units accumulated above a base of 50° F. from time of planting was, however, nearly equal in effectiveness at the two places. The advantage of computing the total sum of thermal units by means of hourly rather than daily averages under certain conditions of fluctuation in temperature is pointed out. The importance of introducing and breeding hybrids with relatively low threshold temperatures for physiological activity for maize production in northern areas is stressed, the possibility that some hybrids will grow at a temperature as low as 45° F. being considered.

3268 Şerbănescu, N.
Polenizarea suplimentară artificială la porumb. (**Artificial supplementary pollination in maize**).
Anal. Inst. Cerc. agron. Român. 1954 : **21** : No. 2 : 49–56.

Appreciable yield increases are reported from supplementary pollination of maize in Rumania.

3269 Pirovano, A.
Effetti concorrenziali fra pollini di tipi dominanti e recessivi nei mais ibridi. (**Effects of competition between pollens of dominant and recessive types in hybrid maizes**).
Ann. Sper. agr. 1956 : **10** : 539–43.

In crosses between sweet and starchy varieties a deficiency of sugary grains has been observed in the ears of the first-generation plants, which may contain as few as 7% instead of the expected 25% when the plants are artificially selfed. This is ascribed to lower competitive ability on the part of the sugary pollen.

It is pointed out that many of the deviations from Mendelian ratios observed by Mičurin and his school are to be expected since many of his parental varieties, such as Reinette de Canada and Beurré d'Amanlis, were triploid.

3270 Grillot, G.
L'amélioration du maïs et de sa culture au Maroc. (**Maize breeding and its cultivation in Morocco**).
Cah. Rech. agron., Rabat 1955 : No. 6 : 3–27.

The cultivation of hybrid maize in Morocco is discussed with special reference to the testing of American introductions. Those American hybrids that have given especially favourable results are listed (cf. Abst. 3271). The importance of Morocco becoming self-sufficient as regards the production of hybrid seed is stressed; it is hoped to have double hybrids suitable for cultivation under non-irrigated conditions in the near future.

3271 CORNU, A.
Les maïs hybrides américains au Maroc. (**American maize hybrids in Morocco**).
Cah. Rech. agron., Rabat 1955 : No. 6: 31–37.

The results of trials during 1949–53 at Rabat, Sidi-Slimane, Boulaouane and Merchouch are summarized and the principal varieties tested described briefly. Late-maturing hybrids gave the highest yields and in this group U72, Texas 24, Texas 26, Dixie 33, U6 and Indiana 909A proved the most productive; of the midlate hybrids, US13 and Kansas 1859 were superior. Ohio K24, Ohio K35 and U35 gave the best results of the midearly varieties and Cornell 29–3 and Sokota 224 outyielded all other early varieties tested.

3272 GRILLOT, M.
L'importance culturale des maïs hybrides au Maroc et les conditions de son accroissement. (**The agronomic importance of hybrid maize in Morocco and conditions for its extension**).
CR Acad. Agric. Fr. 1956 : **42** : 42–47.

Trials in Morocco have shown that some American hybrids, such as U59, US13 and U6 outyield local varieties by as much as 500% under favourable conditions. The American hybrids are not, however, so well adapted to unfavourable climatic conditions or so resistant to sudden periods of drought as the local varieties. Work is in progress to produce local hybrids adapted to Moroccan conditions; in addition it is suggested that local varieties be top crossed with American hybrids to obtain material combining the greater hardiness and adaptability of the former source with the high yielding capacity of the latter.

3273 SCHULER, J. F. & SPRAGUE, G. F.
Natural mutations in inbred lines of maize and their heterotic effect. II. Comparison of mother line *vs.* mutant when outcrossed to unrelated inbreds.
Genetics 1956 : **41** : 281–91.

The homozygous dominant genotype, with the general symbol *DD*, was compared with the heterozygous genotype in a genetically heterozygous but homogeneous background by means of the following crosses (cf. *PBA*, XXV, Abst. 3022). Eight pairs of inbred lines were each crossed with three *DD* testers unrelated to them and derived by diploidization of monoploids. Each pair of inbred lines consisted of the original mother line and its identical substrain except for one of the homozygous recessive mutations corresponding to *dd*, for the following characters: crinkled leaf, narrow leaf, brachytic stalk, green stripe, two nonallelic types of dwarfness and two nonallelic small-seeded conditions. No evidence was obtained of overdominance for yield. Data on other attributes occasionally indicated a superiority of the heterozygotes over the homozygous dominants. Variance ratios provided evidence of differences in genetic composition between mother lines and mutants. The possible causes of heterozygosity in inbreds are briefly discussed.

3274 ROBINSON, H. J., COMSTOCK, R. E., KHALIL, A. & HARVEY, P. H.
Dominance versus over-dominance in heterosis: evidence from crosses between open-pollinated varieties of maize.
Amer. Nat. 1956 : **90** : 127–31.

Crosses between open-pollinated varieties tested in 1952 and 1953 at three centres in North Carolina were superior in yield to the average of the two parents and of the higher-yielding parent by 20% and 11·5% respectively. Since this heterotic effect is indicative of disparities between open-pollinated varieties with respect to genes affecting yield, the view is expressed that the behaviour of intervarietal crosses does not support Crow's theory of overdominance, which is regarded as requiring identical frequencies of genes for yield among the equilibrium populations of parental open-pollinated varieties, if "differences in average grain yield between varieties and selected hybrids involving inbred lines from different varieties" may be considered as critical evidence of the degree of dominance (cf. *PBA*, XVII, Abst. 2017 and XXIII, p. 671). Open-pollinated varieties, it is suggested, may be quantitatively different in gene content as the result of partial inbreeding consequent upon "finite population size"; what is estimated as heterosis in hybrid *vs.* variety comparisons would then be partly restoration of vigour lost by inbreeding, which would be attributable to simple dominance. The authors doubt whether gene-frequency equilibria in relation to mutation and selection, as postulated by Crow, have been attained even within present-day open-pollinated varieties. Preliminary results from intravarietal selection of Jarvis, Weekley and Indian Chief suggest that yield improvements in which dominant genes play at least a part are being effected.

3275 BERZSENYI-JANOSITS, L.
Az egy munkamenetes címerezés a hibridkukorica vetőmagtermesztés megkönnyítésére. (**Detasselling in a single operation to facilitate the production of hybrid maize seed**).
Növénytermelés 1955 : **4** : 141–46.

Preliminary experiments on trial plots at Mosonmagyaróvár, Hungary, have indicated that no decrease in yield results if all the tassels of maize grown for hybrid seed are removed in a single operation instead of at daily intervals.

3276 FRADKIN, C-. W. & BRINK, R. A.
Effect of modulator on the frequency of endosperm mosaics in maize.
Amer. J. Bot. 1956 : **43** : 267–73.

Modulator (*Mp*) increased the frequency of endosperm mosaics with respect to the markers *Cc* (coloured *vs.* colourless aleurone), *Wxwx* (nonwaxy *vs.* waxy) and *Pr pr* (purple *vs.* red aleurone) to three times that occurring in the controls lacking *Mp*. (cf. *PBA* XXV, Abst. 3033). Except for one possible significant case, *Mp* did not affect the markers *Su* for nonsugary and *Y* for yellow endosperm. The frequent simultaneous loss of the linked genes *C* and *Wx* showed that a high proportion of the mosaics resulted from chromosome breakage followed by loss of acentrics. Evidence was obtained of preferential sites in the short arm of chromosome 9 for such breakage, this event being more likely to take place between *Wx* and the centromere than between *C* and *Wx*. Probably the effect of *Mp* upon the formation of endosperm mosaics is primarily indirect, the breaks occurring at the sites of other genetic elements with which *Mp* interacts. The frequency of mosaics for *wx* increased with higher doses of *Mp* but that of mosaics for *pr* declined under the same conditions; the chromosomal components with which *Mp* interacted in the two cases were therefore different.

3277 PHINNEY, B. O.
Growth response of single-gene dwarf mutants in maize to gibberellic acid.
Proc. nat. Acad. Sci. USA 1956 : **42** : 185–89.

Normal growth was induced in the mutants anther ear-1, dwarf-(5232), dwarf-1 and dwarf-(8201) by application of gibberellic acid to the leaves of the seedlings or older plants. The mutants dominant-dwarf and dwarf-(4963) showed only a slight response.

3278 KONZAK, C. F. & SINGLETON, W. R.
The effect of thermal-neutron radiation on mutation of endosperm loci in maize.
Proc. nat. Acad. Sci. USA 1956 : **42** : 78–84.

The rates of alteration of the dominant expression of the loci R^g, *Pr*, *Su* and *Sh* to the recessive phenotype consequent upon treatment of the pollen with thermal neutrons were determined. Most of the changes were presumably genic or chromosomal deficiencies. The loci differed in their response to the treatment. The mutation rate of R^g increased linearly with dose. The mutation rates of the other loci showed a similar linear response to lower doses but smaller increments in the frequency of mutation at higher doses, the loci differing with respect to the range of doses at which this apparent saturation effect was expressed. The mutational responses of R^g, *Pr*, *Su*, *Sh* to thermal neutrons, X rays and ultraviolet radiation are compared.

3279 KONZAK, C. F. & SINGLETON, W. R.
The mutation of linked maize endosperm loci induced by thermal-neutron, X-, gamma, and ultraviolet radiation.
Proc. nat. Acad. Sci. USA 1956 : **42** : 239–45.

Investigations were carried out on mutation induced at the linked loci *C*, Sh_1 and *Wx* on the short arm of chromosome 9, *Pr* on chromosome 9 and the linked loci A_1 and Sh_2 on chromosome 3 by treatment of the pollen with the above radiations. It is assumed that the phenotypic changes observed in the endosperm were due to chromosome breakage. A particular region showed quantitative variation in its response to the different radiations. For instance, relatively more breaks were produced in region II between *C* and Sh_1 by ultraviolet rays and thermal neutrons than by X radiation; more breakage was induced in region III between Sh_1 and *Wx* by X rays than by ultraviolet; breakage in region I between *C* and the end of the chromosome arm and in IV between *Wx* and the centromere occurred with similar frequencies in treatments with thermal neutrons, X rays and ultraviolet. The similarities in the mode of action of the radiations are, however, regarded as being of more significance than the minor differences.

3280 MESA BERNAL, D.
El maíz de America y el panizo del nuevo mundo. (**The maize of America and the millet of the new world.**
Agricultura trop. 1956 : **12** : 155–58.

Extracts from early records are given to show that the discoverers of America applied the word *panizo* [millet] to the maize they found there, that Columbus brought seeds of it to Europe on his third voyage, and that it was recognized as distinct from any cereal previously known in Europe.

3281 MESA BERNAL, D.
Informaciones geológicas, arqueológicas y botánicas sobre el origen del maíz. (**Geological, archeological and botanical information on the origin of maize**).
Agricultura trop. 1956 : **12** : 229–40.

The discovery in Mexico of fossilized pollen of maize, teosinte and *Tripsacum* is thought to strengthen the views that maize originated in America and that teosinte is a hybrid between *Zea* and *Tripsacum*. A description is given of the other genera of the Maydeae and of the supposed primitive maize. Though this was thought to be a tunicate type the evidence that *Z. tunicata* is the ancestor of modern cultivated maize is not considered convincing.

3282 FABERGÉ, A. C.
The analysis of induced chromosome aberrations by maize endosperm phenotypes.
Z. indukt. Abstamm.- u. VererbLehre 1956 : **87** : 392–420.

Maize pollen carrying the dominant endosperm markers *I*, *Sh*, B_3 and *Wx* was irradiated with X rays and ultraviolet rays of the wave length 2537 Å and subsequently used to pollinate plants of the constitution $C\ sh\ b_3\ wx$. Of the 15,042 kernels obtained, 1347 proved to have been affected by the irradiation of the pollen; chromosome breaks in this material were studied (cf. *PBA*, XXV, Abst. 3031). It was demonstrated that a free broken chromosome end generates a breakage-fusion-bridge cycle that conforms to a recognizable pattern and so permits the determination of a marker gene sequence; a gene map may thus be constructed from the frequency with which such breaks arise in marked chromosome segments. It is thought unlikely that stable chromosome ends arise in maize endosperms as the result of irradiation; if they do occur, their quantitative influence is negligible.

3283 BELOZOROV, A. T.
(**Maize cultivation in the Omsk province**).
Agrobiologija (Agrobiology) 1956 : No. 2 : 139–44. [Russian].

This article, dealing mainly with agricultural methods, mentions maize varieties and hybrids which proved productive in the 1955 trials at Omsk. Varieties grown for their grain are mainly early forms such as Pervenec [Firstborn] and Mestnaja Belaja [Local White]. Among the high-yielding forage types are several F_1 interline hybrids from the Institute of Plant Industry.

3284 KLIMOV, JA. I., KUŠNIRENKO, JU. D. & ERMOLOVA, A. N.
(**Some questions of maize cultivation in the southern Urals**).
Zemledelie (Agriculture) 1956 : No. 1 : 33–36. [Russian].

Bezenčuk Hybrid 41 produced more grain and forage than other early strains tested at Čeljabinsk. The late and midseason varieties failed to produce ripe grain.

3285 BRANDOLINI, A.
Mais in coltura estivo-autunnale dopo frumento. Parte I. (**Maize in summer-autumn cultivation after wheat. I**).
Ann. Sper. agr. 1956 : **10** : 1007–28.

The conditions under which maize is grown in Italy as a second crop after wheat are examined. Some of the hybrid maize varieties were tested in comparison with Sacra Famiglia [Holy Family], a variety commonly used for this purpose. None of the very early group of hybrids yielded as well as the control, those considered promising as an alternative to Sacra Famiglia being Wisc. 270, Min. 706, U22 and U24A, all in the early group.

3286 POLFEROV, V. P., KUZJMIČEV, V. P. & KULEŠOV, N. N.
(**The development and ripening of the grains in an ear of maize**).
Fiz. Rasten. (Phys. Pl.) 1956 : **3** : 36–42. [Russian].

Observations at Harjkov on the order of emergence of styles on different portions of the ear and on occurrence of xenia in the ears of a white-grained variety pollinated at 24-hourly intervals by a dark-grained variety are reported and the results of analyses of the state of ripeness of the grains from different portions of the ear, based on their moisture contents, are presented. The evidence showed that the time of formation of each grain and the state of ripeness of each at harvesting varied, depending on its position in the ear.

3287 **Field crop varieties in Wisconsin.**
Circ. Wis. agric. Exp. Sta. 1955 : No. 463 : Pp. 8.

Notes are given on suitable hybrids and open-pollinated varieties of maize and varieties of wheat, oats, rye, forage crops, flax and soya bean. Most of the maize seed used consists of double hybrids but recently a series of three-way crosses, superior in uniformity and general performance, has been introduced. Another recent development mentioned is the use of male-sterile inbreds in hybrid production.

3288 GALEEV, G. S.
(The work on breeding maize at the Kubanj Research Station of VIR).
Agrobiologija (Agrobiology) 1956 : No. **1** : 18–27. [Russian].

Maize breeding, notably the production of single and double-cross hybrids, at the Institute of Plant Industry (VIR) is discussed. Various technical details such as the mode of selection of productive lines and combinations are also dealt with. New high-yielding hybrids resistant to drought, lodging and fungi and possessing other valuable attributes have been developed. Most outyield the standard double-cross hybrid VIR 42 and surpass it in lodging resistance. VIR 281 is less susceptible to drought and VIR 267 and VIR 264 are notable for their productivity on irrigated land. Work on the production of male-sterile lines from Moldavanka Oranževaja [Orange Moldavian] and Moldavanka Želtaja [Yellow Moldavian] is described and a scheme of selection which is used for imparting male sterility to the double-cross hybrid VIR 42 is presented.

3289 **Hog high corn.**
What's New Crops Soils 1956 : **8** : No. 6 : p. 26.

A large-eared variety 50 in. tall has been developed at the University of Wisconsin.

3290 KRAMER, H. H., WHISTLER, R. L. & ANDERSON, E. G.
A new gene interaction in the endosperm of maize.
Agron. J. 1956 : **48** : 170–72.

A new recessive gene *ha* which increases amylose content to about 60% without increasing the water-soluble polysaccharides and results in a slight discoloration of otherwise normal dent kernels is described. In the presence of homozygous *su*, *Ha* produces the typical wrinkled phenotype but *ha* gives well-filled translucent kernels described as glassy. Pollen grains with the *suha* genotype do not appear to compete equally with *suHa* types but the ovules show no differential transmission of the alleles. The locus *ha* lies on chromosome 5.

3291 URANO, K.
(Studies on the diagnosis of relationships between maize strains using the precipitin reaction. I. On the precipitin reaction between inbred lines of maize).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **24** : 4–7. [Japanese].

Precipitin reactions between three lines isolated from Reid's Early Yellow maize were studied. The antigen was prepared by boiling the pollen in 0·85% NaCl and using the filtrate. The antisera were prepared from rabbits. Marked precipitin reactions occurred between inbreds that had been isolated comparatively early; a less marked reaction was found between either of these strains and a line isolated later.

3292 URANO, K. & ODOGIRI, K.
(Studies on the diagnosis of relationships between maize strains using the precipitin reaction. II. On protein constitution in relation to serum reaction).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **24** : 7–8. [Japanese].

Analysis of the antigens prepared from the pollen of the maize strains referred to in Abst. 3291 revealed differences in the albumin and α-globulin fractions.

3293 SCHRÖDER
Zur Sortenwahl bei amerikanischen Silomais-Hybriden. **(On the choice of American hybrid maize varieties for silage).**
Mitt. dtsch. LandwGes. 1954 : **69** : 71–72.

Five American hybrids were compared with Gelber Badischer Landmais [Yellow Baden Land maize] in trials to determine which American varieties were most suitable for silage purposes. Pioneer 382 and Pioneer 322 had the highest dry matter and protein contents, but the German variety matured earliest. Not all American maize hybrids are adapted to German conditions. Only early varieties should be imported.

3294 PORTÈRES, P. R.
L'introduction du mais en Afrique. **(The introduction of maize into Africa.)**
J. Agric. trop. Bot. appl. 1955 : **2** : 221–31.

By means of historical documents and linguistic evidence the author traces the expansion of maize cultivation in Africa since the 16th century and concludes that maize was introduced into the continent by two different routes, via Egypt and the Gulf of Guinea respectively. Flint maize, brought to Egypt by the Turks in the 16th century, spread westwards along the North African Coast and southwards down the Nile valley. Dent maize was introduced directly from South America to the Coast of Guinea and spread inland. Doubt is cast upon the validity of Jeffreys' conclusions with regard to the existence of maize in Africa before Columbus and it is suggested that the pots he describes as being decorated by having a maize cob rolled over the wet clay (cf. *PBA*, XXIV, Abst. 1088) are of comparatively recent origin.

3295 HOOKER, A. L.
Correlation of resistance to eight *Pythium* species in seedling corn.
Phytopathology 1956 : **46** : 175–76.

This is a full account of work briefly described in an earlier report (cf. *PBA*, XXIV, Abst. 1089).

3296 **Rust-resistant corn from South America may soon benefit U.S.**
What's New Crops Soils 1956 : **8** : No. 6 : p. 26.

Rust-resistant forms of maize found in Peru, Ecuador and Mexico are being used in a backcrossing programme to improve rust resistance in commercial varieties. One of the South American lines is reported to be immune to all known rust races.

3297 RATTRAY, A. G. H.
Agricultural Experiment Station, Salisbury. Annual Report of Experiments, season 1954-1955.
Rhod. agric. J. 1956 : **53** : 86–101.

Projects at the above station, S. Rhodesia, include the following maize breeding. Advanced inbreds are being tested for combining ability in three-way crosses with N3–1–4–9 x A5–7–6 as tester, a single hybrid now used as ♀ parent in the production of commercial hybrids. Inbreds with the highest combining ability are to be substituted for those used at present to obtain single hybrids for crossing on to N3–1–4–9 x A5–7–6. Resistance to *Helminthosporium turcicum* is to be incorporated in Rhodesian lines by back crossing.

3298 **Three new VPI-developed corn hybrids released to seed producers this year.**
Sth. Seedsman 1956 : **19** : No. 4 : 20–21.

The following leaf-blight resistant hybrids, developed at the Virginia Polytechnic Institute, have been released: VPI 426 (formerly Va. 126), superior in yield, standing capacity and grain quality to Ohio C–54, which it is expected to replace; VPI 648 (formerly Va. 148), which resembles but is superior to VPI 646; and VPI 730W, a white hybrid equal in yield but superior in quality to Indiana 750 and VPI 900W and 10 days earlier than the latter variety.

3299 PENNY, L. H. & DICKE, F. F.
Inheritance of resistance in corn to leaf feeding of the European corn borer.
Agron. J. 1956 : **48** : 200–03.

In investigations at the Iowa Agricultural Experiment Station, the progenies of the maize crosses M14 x MS1 and B14 x N32, representing susceptible x resistant combinations, were graded for leaf feeding by borers (*Pyrausta nubilalis*) by means of a scale based on both the amount of feeding and the size and type of individual feeding areas. Data from F_3 and selfed BC_1 progenies suggested that at least two or three genes, with no appreciable degree of dominance, were involved in borer resistance: *A*, a major gene, and the minor genes *B* and *C* which tend to intensify resistance in the presence of *A*. The following genotypes are proposed: MS1, *AABBCC*; M14 *aabbcc*; N32, *AABBcc*; and B14, *aabbCC*. In general, a high degree of resistance to borer depends upon several genes, in which case it would be necessary to introduce some form of recurrent selection into the backcrossing programme so as to accumulate modifiers with an intensifying effect.

BARLEY

3300 ANTONOV, A.
Přehled povolených odrůd ozimého ječmene. (**Survey of certified varieties of winter barley**).
Za vysokou Úrodu 1955 : **17** : p. 327.

The winter barleys Stupice and Pavlovice have been entered among the Czech regional standards. A detailed account of certified varieties and of the results of field trials with them in the year 1954 is given.

3301 GELIN, O. E. V.
Conditions affecting radiation induced cytological changes in barley.
Agri hort. genet., Landskrona 1956 : **14** : 137–47.

In barley seeds containing 8·5, 10·7 and 19·1% of water, sensitivity to X irradiation, expressed in terms of frequency of mitotic disturbances, ear fertility, mutation rate and percentage survival, increased with decreasing water content and with increasing X-ray dose. The frequency of chromosomal rearrangement was reduced by a high germination temperature, fewer mitotic disturbances being observed at 22° C. than at 11° C. This effect, which is thought to be due to the influence of temperature on the rate of recombination of broken chromosomes, was greater in seeds irradiated at a high water content than in seeds irradiated when dry.

3302 OVEČKA, V.
Nové vyšlechtěné odrůdy—zdroj vyšších výnosů. (**Newly bred varieties, a source of higher yields**).
Za vysokou Úrodu 1955 : **17** : 327–28.

Varieties bred at the Czech breeding station at Valtice are mentioned. A detailed account is given of the winter barley Pavlovice, including its economic importance, and its requirements as regards soil, climate and cultivation.

3303 WILTEN, W. & COENRADIE, J.
De veldproeven in 1955. (**The field trials in 1955**).
20e Nacobrouw Jb. 1956 : 83–93.

Data are presented on yield, period to maturity, number of plants and ears per m.², stiffness of straw, malting quality and resistance to *Ustilago nuda* and *Helminthosporium sativum* of spring barleys tested at Zevenbergen and six other centres on clay soils in the Netherlands in 1955. Piroline (cf. *PBA*, XXIV, Abst. 327), Proctor (cf. *PBA*, XXIII, Abst. 1180), Carlsberg (cf. *PBA*, XXII, Abst. 2707), Vada (=PB26) and Firlbeck 10443, all of which gave approximately the same yields, were the most productive. Maythorpe (cf. Abst. 1283) and Weibull 5425, both of which were tested for the first time in the Netherlands, also showed promise. Pirkka (cf. Abst. 1284), Abed 978 and Domen were outstanding as regards the malting quality of their grain but their yields were well below those of the varieties listed above. Carlsberg was notable for its high 1000-grain weight and low protein content and Proctor for its low nitrogen content. A number of German varieties, including Firlbeck 10443, were highly resistant to mildew.

3304 DE HAAN, H.
Winter barley breeding in the Netherlands.
Euphytica, Wageningen 1956 : **5** : 8–12.

The history of winter barley breeding in the Netherlands is surveyed. The most extensively used foundation material for breeding has been Groninger wintergerst [Groningen winter barley], from which eight important varieties have been derived by line selection. Varietal acreages in the Netherlands over the period 1933–55 are shown in a graph.

Annual Meeting of the Malting Barley Improvement Association, Milwaukee, Wisconsin. Progress Report 1955:
Pp. 88 + xvii. (Mimeographed).

3305 *Progress reports on barley variety testing, breeding and improvement, 7 states. (pp. 32–46).*

At the North Dakota Agricultural College, the variety B103 (cf. Absts. 1287 and 3307) now named Traill, has continued to do well in tests. Brandon 3833 and the Canadian selection UM570 have performed well in all trials. Fox (Wis.X330–5) resembles Kindred in yield but has stronger straw. B112 (Kindred x CI7117–77), which is resistant to *Septoria*, stem rust, spot blotch, net blotch and mildew and has good straw strength, is being used as a parent in the breeding programme. Promising new material has been obtained from B103 x B100 and some of the best selections from this cross are being back-crossed to B103. B103 is also being crossed with UM570. Tolerance of stripe mosaic is being transferred from CI3212 and CI3212–1 to other varieties.

At the University of Minnesota, preliminary results of crosses and back crosses between six-rowed and two-rowed parents indicate that it is possible to combine the six-rowed character with a high tillering capacity. A number of plants equalling Feebar in resistance to *Septoria passerinii* have been found among F_5 lines of Feebar x Kindred and Montcalm x Feebar. Rika and Moravian have been crossed with the stem-rust resistant variety Gospick.

The South Dakota lines 1761 and 1776 have continued to do well in trials in the main barley-growing areas in South Dakota. Back crosses of Odessa x Feebar to Odessa are being tested for straw strength and other agronomic qualities. Promising stiff-strawed lines have been obtained from Montcalm x (Moore x Anoidium), Montcalm x (Kindred x Bay), Kindred x Bay and Chevron x Bay at Michigan State College.

Selections from crosses of Pillsbury with Moore, Mars, Plains and Peatland x Mariout and from the cross (Moore x Pillsbury) x Kindred have been doing well in Iowa State College Nurseries and a number of selections with CI9539 (Manchuria x Chevron) as one parent have shown promise.

At Montana State College, attempts are being made to incorporate factors for seed size, tillering, the two-rowed character and resistance to stripe mosaic into the six-rowed fodder barley Titan. The hull-less character is being introduced into Compana, Titan, Vantage and Glacier. Isogenic lines differing only in being two-rowed or six-rowed are being developed in a number of varieties by back crossing. Dekap (CI3351) and a Compana x Morgenrot [Dawn Red] selection have done well in tests under dry-land conditions.

3306 *Reid, D. A. Winter barley in the United States. (pp. 47–52).*

Mention is made of the following breeding objectives: winter hardiness; resistance to drought, diseases and lodging; quality; suitability for combine harvesting; adaptation to acid and wet soils; and resistance to damage by insects.

3307 *Some new barley varieties of potential importance. (pp. 58–60).*

Traill (B103), developed from Titan x Kindred at North Dakota Agricultural College, resembles Kindred in disease reaction and malting and brewing characteristics but gives 20% higher yields and has stiffer straw.
Of the other barleys described, UM570 has been dealt with in Abst. 1287, Fox in Abst. 2144 and Husky in *PBA*, XXIV, Abst. 1993. Brandon 3833 [(Olli x Montcalm) x Brandon 1136] has given high yields at Brandon Experiment Station, Manitoba.

3308 *Experimental malting tests of 1954 crop samples of barley. (pp. 60–65).*

Data are given on the percentages of plump and thin kernels, protein content and malt analyses of ten varieties, the results being obtained from samples grown in various districts in the USA and Canada in 1954.

3309 Sierra F., J. H., Rico M., E. & Rupert, J.
Programa de mejoramiento de la cebada.
(Programme of barley improvement).
Agricultura trop. 1956 : **12** : 257–60.

All the barleys grown in Colombia are very mixed and collections have been made in different areas; all are six-rowed forms of *Hordeum vulgare*. By mass selection from one of the collections an improved variety Funza was developed, intermediate in type between Coast and Manchuria. Other improved varieties have now been produced by hybridization, the most promising being from Funza x Tchechostor 929 II–211, Funza x Montcalm 1177 and Peatland x Raspa II–15. A list is given of some of the most successful hybrids.

3310 Suneson, C. A.
An evolutionary plant breeding method.
Agron. J. 1956 : **48** : 188–91.

Each of four composite barley crosses was grown in mass under conditions of natural selection for 12–29 generations. Early generations (F_2 — F_8) were inferior but later generations almost equal in yield to Atlas 46. The proportion of superior lines in a population appears to increase with successive generations. An F_{20} selection has given an average of 37% and three F_{24} selections 56% higher yields than Atlas 46. The composite crosses tended to be later in maturity than commercial varieties. Natural selection for yellow dwarf resistance in an F_{25} population favoured progeny from the three most resistant parents and comparisons of the F_{25} and F_{26} indicated that increase in resistance was accompanied by a slight reduction in yield. Since the method is effective and cheaper to carry out than conventional breeding techniques, the following programme is suggested. After 15 generations of natural selection in the area of intended use the bulked hybrid population may be subjected to (1) continued natural selection, (2) cyclic hybrid recombinations with intervening periods of natural selection or (3) conventional selection and testing.

3311 Gelin, O. E. V.
The meiotic response to the mitotic disturbances in X-rayed barley.
Agri hort. genet., Landskrona 1956 : **14** : 107–26.

Meiosis was studied in the X_1, X_2 and X_3 of the barley Gull [Golden] after X irradiation at 10,000 r. of seeds containing various percentages of water (cf. Abst. 1303). Rings of four occurred in some X_1 and X_3 plants but lagging chromosomes, interstitial chiasmata, degeneration of pollen mother cells and other disturbances were found with equal frequency in both irradiated and untreated material. Seeds of the barley Maja were X-irradiated (*a*) with 10,000 r. at various moisture levels and (*b*) with doses increasing from 5000 to 25,000 r. at constant water content. Meiotic disturbances in the X_1 resembled those in Gull but showed a higher frequency of aberrant chromosome configurations, the most common type being $5_{II} + 1_{IV}$. There was no apparent increase in frequency with higher doses. Sterility in irradiated material was often marked but appeared to be unrelated to the observed meiotic disturbances. In 80% of the cases investigated, the quadrivalent ring was in the disjunction position at metaphase I.

3312 Schelling, P.
Verbetering van de homogeniteit van het gerstras Balder. (**Improvement of the homogeneity of the barley variety Balder**).
20e Nacobrouw Jb. 1956 : 65–77.

In view of the lack of homogeneity in the Swedish two-rowed spring barley Balder, line selection was carried out at the Hoofddorp Plant Breeding Station, Netherlands, to remedy this defect. Some 5000 lines, each of which originated from a single ear, were studied; a wide range of diverse types, differing in the shape and colour of their leaves, the length and stiffness of their straw, the morphological characteristics of the grain and ear, yield of grain and straw and malting quality of the grain, was observed. Only one of the lines, designated Balder 50·4, was adjudged suitable for bulking and future release to farmers. It is homogeneous as regards morphological characteristics and, compared with the original Balder parent, has shorter and stiffer straw and matures slightly earlier; the yield and malting quality of the grain of the new selection are the same as those of the parent variety.

3313 Nybom, N.
On the differential action of mutagenic agents.
Hereditas, Lund 1956 : **42** : 211–17.

Further data on barley have confirmed the previous conclusion that neutron treatment results in a higher frequency of *erectoides* mutations than X irradiation (cf. *PBA*, XXV, Abst. 158). Translocations induced by either X rays or neutrons are not as a rule associated with any deleterious effect upon vigour as measured by grain yield. The breakage surfaces obtained with neutrons do not thus appear to differ from those induced by X rays. *Erectoides* mutants induced by sparsely ionizing radiation (X rays and γ rays) and by densely ionizing radiation (neutrons and α rays) do not show any significant differences in vigour; nor do morphological mutants induced by X rays and neutrons.

3314 Nybom, N., Gustafsson, Å., Granhall, I. & Ehrenberg, L.
The genetic effects of chronic gamma irradiation in barley.
Hereditas, Lund 1956 : **42** : 74–84.

Even with the lowest dose rates (5–10 r. per day), a substantial increase in the frequency of chromosomal rearrangements leading to sterility in the γ_2 generation and in the frequency of recessive mutants appearing in the γ_3 was obtained in the progeny of plants exposed from germination to ripening to radiation from an outdoor Co^{60} source at the Balsgård Fruit Breeding Institute, Sweden. In so far as they are comparable, the rates of mutation induced by acute and chronic γ irradiation appear to be similar. With the vegetation period divided into (1) germination to heading, (2) flowering to maturity, (3) heading to maturity and (4) germination to maturity, no period specially sensitive to γ rays was detected. The mode of appearance of mutant characters in the γ_2 and γ_3 varies according to whether the genetic changes involved occurred before or after fertilization; possibly the type of mutant character also depends upon time of origin.

3315 Yamamoto, Y.
(**The value of tetraploid barleys as material for brewing**).
Bull. Brew. Sci., Tokyo 1955 : **1** : 16–18. [Japanese].

Comparative data on agronomic characters, starch and protein contents, and malting quality are provided for 2*n* and 4*n* strains of three 2-rowed and two 6-rowed Japanese malting barleys. The tetraploids had short stems and were highly sterile; their proteolytic and amylytic activities were slightly higher than those of the diploids.

3316 Garkavyĭ, P. V.
(**Breeding a winter-hardy barley on the basis of directed training and hybridization**).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 2 : 20–25. [Russian].

In the 1952–1953 trials at Odessa with winter barley, Odessa 17 proved hardier than Krymskiĭ Mestnyĭ [Local Crimean], Krasnodar 1918, Ryškanskiĭ and Krasnyĭ Dar [Red Gift]. The variety was obtained by training the spring barleys Pallidum 153 and Pallidum 281 for the winter habit. The winter forms were then crossed and resultant hybrids again sown as winter cereals for several generations.

3317 **Report of the Barley Committee of the European Brewery Convention 1954** (1956) : Pp. 84.

The results of comparative trials of the spring barleys Busser, Carlsberg II, Herta and Proctor, tested in 1954 in thirteen west-European countries with Kenia as standard, are reported in detail. Because of the exceptionally bad weather conditions, overall varietal differences in yield were not significant. Carlsberg II reacted badly to the adverse conditions but Proctor gave good grain yields and malt-extract yields. Herta gave the best agronomic performance but was unsatisfactory as a malting barley.

European Brewery Convention. Proceedings of the Congress, Baden-Baden 1955 : Pp. 358.

3318 *Rokita, W. Heferassen und Bierqualität. (Yeast strains and beer quality). (pp. 84–89).*

Using modifications of the methods devised by Jansen and Mendlik and by Hoffmann and Thorne respectively, the flocculation and fermentation abilities of twelve strains of bottom yeast were compared in laboratory experiments to obtain information on whether laboratory tests provide a reliable means of assessing the comparative suitability of yeast strains for the brewing of certain types of beer. It was concluded that such tests may be useful in eliminating definitely inferior strains but that large-scale practical trials in the brewery are essential for finding the best strain for the production of a given type of beer.

3319 *van Roey, G. & Hupé, J. Activité cytolytique, sucres libres et comportement au maltage de quelques variétés d'orge. (Cytolytic activity, free sugars and malting behaviour of some varieties of barley). (pp. 158–67).*

Data on cytolytic activity, content of gums and free sugars, intensity of respiration, degree of viscosity and rate of modification are provided for 32 varieties of European, North American and Australian origin. A positive correlation was established between rapid germination and high sugar content. The respiratory activity of germinating barley during the first 2–3 days was shown to be determined by the amount of original sugars present; for barleys with a low cytolytic activity during germination these sugars are the major controlling factor but for barleys with a high cytolytic activity the respiratory activity may be increased by the sugars produced during early cyclosis. Rate of modification during malting is related to gum content and cytolytic activity during germination; the best modification was obtained with barleys of low gum content and high cytolytic activity. Barleys with a high sugar content usually had a low gum content.

3320 *Szilvinyi, A. Gerstensorte und Bierqualität. (Barley variety and beer quality). (pp. 223–32).*

Grain of the spring barleys Herta and Carlsberg II was analysed to obtain information on the effect of variety and fertilizer treatment on protein content and chemical composition of the crude protein. Carlsberg II produces a beer of good quality, whereas Herta is a poor malting barley producing mostly opalescent to dull worts. The proteins of the grain of each variety were fractionated at milky, yellow and full maturity. It was shown that (1) an increase in the amount of fertilizer decreases the protein content of both varieties and that Herta takes up more nitrogen than Carlsberg II; (2) the proportion of salt-soluble protein, calculated as a percentage of the total protein content, increases in proportion to the amount of fertilizer given and decreases as the grain matures, this decrease being more marked in the case of Herta than of Carlsberg II; (3) the hordein fraction increases as the grain matures, this increase being more pronounced in Herta than in Carlsberg II; (4) the glutelin fraction is higher in Herta and constant through all stages of ripening; in Carlsberg II it tends to decrease as the grain matures; (5) the amount of residual protein I is the same for both varieties but the amount of residual protein II is higher in Herta. The formula $\frac{\text{hordein fraction}}{\text{glutelin fraction} + \text{residual protein II}}$ is suggested for determining the malting value of a barley. Values under 1·0 suggest a poor malting barley yielding opalescent to dull worts. In the above experiments the values obtained for Carlsberg II and Herta were 1·02–1·16 and 0·64 respectively.

3321 *Horne, F. R. Improvement of seed stocks of malting barley varieties. (pp. 261–66).*

The importance, to the farmer, of choosing a variety suited to his own particular requirements is stressed; good malting quality should be combined, as far as possible, with high yield, satisfactory straw strength and adequate disease resistance. Seed stocks should be true to name and not contain seeds of other barley varieties, other cereals or weeds. They should also be free from infection by loose smut and other diseases. Seed stocks can best be maintained at a high standard of purity after they leave the breeder by a careful examination of the growing seed crop. In England, a scheme has been adopted by which representatives of the approved seed growers' associations and seed merchants are given a period of training as inspectors at the National Institute of Agricultural Botany, Cambridge. These inspectors, when qualified, inspect growing seed crops throughout the country and are supervised by a small staff of official technicians.

3322 *van Veldhuizen, H. The Barley Committee of the European Brewery Convention. (pp. 271–81).*

The results of the 1953–54 trials are discussed; of the new varieties tested Proctor (cf. *PBA*, XXIII, Abst. 1180) was outstanding as regards malting quality and malt extract yield. Carlsberg II gave the highest yields of grain and provided the most satisfactory agricultural return. Herta is to be excluded from future trials because of its low extract yield.

3323 Bass, E. J. & Meredith, W. O. S.
Enzymes that degrade barley gums. IV. Studies of varietal differences in endo-beta-polyglucosidase activity.
Cereal Chem. 1956 : **33** : 129–35.

The cytolytic activity of the green malts of nine barley varieties grown at four stations in Canada during 1954 was determined viscosimetrically and found to be a pronounced varietal characteristic. High activities were in general associated with satisfactory malting quality and low activities with inferior quality. Br. 3833 was however anomalous, having a cytolytic activity significantly lower than that of the standard OAC21 but producing a high quality malt. Further investigation is therefore necessary before the method can be used in breeding.

3324 Aufhammer, G. & Fischbeck, G.
Ergebnisse internationaler Braugersten-Anbauversuche in Süddeutschland. (**Results of international cultural trials of malting barleys in southern Germany**).
Z. Acker- u. PflBau. 1956 : **101** : 22–34.

A full report is given of field and malting trials carried out in southern Germany from 1952 to 1955 under the egis of the Barley Committee of the European Brewery Convention. Carlsberg proved superior in yield, followed by the Swedish variety Herta and the German varieties Nova, Wisa and Donaria. Proctor gave the highest yields of straw but its grain yield was 12% below that of Carlsberg and 10% below that of Herta. In general, Scandinavian varieties tended to have shorter straw and a more compact growth habit than German varieties and also to possess less resistance to *Erysiphe hordei*. Data on malting quality, including extract values, resistance to various diseases and 1000-grain weight are included for each variety tested; the high extract values of the German varieties Donaria and Wisa were noted. Carlsberg, which gave the highest yields of all varieties in the trials, had a lower protein content than any other variety.

3325 Coenradie, J.
Enkele gezichtspunten op de moutanalyse in verband men het rassenonderzoek van brouwgerst. (**Some aspects of malt analysis in connexion with research on varieties of malting barley**).
20e Nacobrouw Jb. 1956 : 51–57.

Factors affecting the validity of the results of variety trials are discussed; it is shown that malting quality is influenced more by the chemical composition of the soil, the amount and type of fertilizer administered and the crop previously grown than by weather conditions. In assessing the malting quality of a new variety it is therefore essential that this variety be compared with a standard grown at the same time and under identical conditions.

3326 Munekata, H., Kato, S. & Goto, S.
(**Chemical properties of barley varieties. I. Methods of determining water-soluble proteolytic and amylolytic activity**).
Bull. Brew. Sci., Tokyo 1955 : **1** : 7–15. [Japanese].

Revised methods of determining the above two characteristics of barley or malt extract are described and applied to a series of Japanese malting barleys.

3327 Plumet, H.
Étude des facteurs conditionnant la qualité des orges de brasserie. (**Study of factors conditioning the quality of malting barleys**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1955 : **5** : 575–614.

Research on factors influencing malting quality and technological properties in barley showed that protein content was mainly determined by external environmental conditions, in particular temperature and rainfall. No significant differences in protein content were observed between varieties tested under identical environmental conditions. Proportion of husk was largely a varietal characteristic. External environment and choice of variety were approximately of equal importance in determining the content of malt extracts.

3328 YAMAMOTO, Y., FUJITA, M. & TAKAHASHI, T.
(On the typification of the principal Japanese varieties of malting barley).
Bull. Brew. Sci., Tokyo 1955 : **1** : 1–2. [Japanese].

The varieties are classified in respect of vegetative period, height, rachis length, rachilla hairs and intensity of anthocyanin pigmentation.

3329 WARD, D. J.
World collection of barley. Data compilation No. 4 : Disease and agronomic notes recorded on the world collection of barley grown at Bogota, Colombia in 1953.
US. Dep. Agric. 1953 : Pp. 148 (Mimeographed).

Observations made at Bogotá on varieties from the world collection of the United States Department of Agriculture are recorded in tables, information being provided on the country of origin, reaction to leaf, stem and stripe rusts, powdery mildew, *Rhyncosporium secalis* and *Helminthosporium* spp., adaptation, growth habit and number of days from sowing to heading.

3330 TROFIMOVSKAJA, A. JA. & CEHANOVSKAJA, N. A.
(The resistance of different barley varieties to loose smut).
Agrobiologija (Agrobiology) 1956 : No. 1 : 62–69. [Russian].

Hanna Loosdorf, Colchicum 10/30, Zalarinec, Binder, Zolotoĭ [Golden] and Primus showed good resistance in artificial infection trials at the Institute of Plant Industry and in tests conducted under field conditions by the State Varietal Commission.

3331 KIRÁLY, Z. & KOVÁCS, A.
Őszíárpa-fajták porüszögfogékonyságának vizsgálata mesterséges fertőzéssel.
(Investigation on the loose-smut susceptibility of winter barley varieties by means of artificial inoculation).
Növénytermelés 1955 : **4** : 219–24.

Of 21 barleys inoculated by spraying the flowers at maturity with a suspension of chlamydospores, the two varieties Hatvani 445 and Beta Kétsoros [Beta Two-rowed], both tested over two years, were moderately resistant and Krasnodar 2929, tested in one year only, was highly resistant to infection.
Resistance did not appear to depend on any structural difference between the flowers of resistant and susceptible varieties.

3332 LEVINE, M. N. & CHEREWICK, W. J.
Greenhouse and fieldplot studies on varietal reactions to barley leaf rust.
Canad. J. agric. Sci. 1956 : **36** : 127–43.

Of 324 barley varieties and selections tested at St. Paul, Minn. and Winnipeg, Man., for seedling reaction to *Puccinia hordei*, 99 were moderately resistant to each of the rust races used, the number of races with which each barley was tested varying from 1 to 21; 122 barleys were resistant to some races and susceptible to others. Adult reaction to natural infection was investigated in 100 barleys over a period of 20 years and of these only 3 were consistently resistant, namely Lyallpur E, Rabat and CI7122; a number of others had a high average resistance but each showed a sudden breakdown in resistance in one year during the trial period. Among 234 varieties and selections tested over four years for adult reaction to artificial inoculation with mixtures of races, nearly two thirds showed an average of 2·5% infection or less. Varieties resistant in the seedling stage were generally resistant as adults and a few showing seedling susceptibility became resistant when mature.

3333 MILLER, J. D. & LAMBERT, J. W.
Reactions of certain spring barley lines to race 59A of stem rust.
Plant Dis. Reptr. 1956 : **40** : 340–46.

Varieties and lines from the breeding programme of the Minnesota Agricultural Experiment Station and varieties from a world collection were classified for their adult-plant and seedling reactions to race 59A of stem rust, on the combined basis of pustule type and percentage of infection. In the adult-plant test, none of the commercial varieties used in the breeding project showed resistance. Many hybrid lines, e.g. derivatives of Minn. 601 x Wis. H–35, Mars x Kindred and Brandon 1136 x Kindred, were graded as resistant, most of them developing the type of pustule characteristic of susceptibility. Adult-plant resistance to race 59A does not depend upon the factor *T* for stem-rust resistance derived from Peatland or Chevron. Of the 1042 barleys from the world collection, 37 were resistant at the adult-plant stage but only Black Hulless developed the pustule type denoting a resistant response. The association between adult-plant and seedling reactions was fairly close.

3334 Skoropad, W. R. & Arny, D. C. **Histologic expression of susceptibility and resistance in barley to strains of *Helminthosporium gramineum*.**
Phytopathology 1956 : **46** : 289–92.

Histological investigation on four barleys differing in reaction to two strains of *H. gramineum* showed that fungal penetration into the coleorhiza was similar in susceptible and resistant varieties but that in susceptible individuals the mycelium spread throughout the seedling while in resistant plants mycelial growth was arrested after passing through two or three layers of host cells by formation of pockets of necrotic tissue in which both host and parasite cells died.

MILLETS AND SORGHUMS

Special millet number.
Poona agric. Coll. Mag. 1955 : **46** : 69–259.

Sponsored by the Indian Council of Agricultural Research, an All-India Millet Workers' Conference was held for the first time at Kolhapur, Bombay State, 16–18 May 1955. This issue contains papers submitted to this conference, together with other articles and miscellaneous sources of information. Items dealing with breeding and genetics are summarized below, and unless otherwise stated, describe work in Bombay State.

One of the appendices gives information on improved strains of millet for this state. Separate bibliographies on sorghum, *Pennisetum typhoides*, *Eleusine coracana*, *Setaria italica* and other millets are also included for the benefit of those interested in breeding and other fields.

3335 *Pandya, P. S., Chavan, V. M., & Shendge, P. Y. A brief review of research work done on* jowar (Sorghum vulgare *Pers*) *in Bombay State.* (*pp. 79–83*).

Sorghum selection and hybridization in the Gujarat, Deccan and Karnatak districts are among the activities reviewed. Cytological work recently undertaken in Karnatak has thrown light on the difficulties of crossing cultivated sorghums with species of sect. *Parasorghum*.

3336 *Chavan, V. M., Kajjari, N. B. & Kurtakoti, F. B. Improvement in* Kanvi jowar *a typical early* kharif jowar *variety of Dharwar district.* (*pp. 84–86*).

Selection of the local grain sorghum Kanvi, the chief crop grown in the monsoon season in Dharwar, has resulted in the high-yielding strain K–588.

3337 *Chavan, V. M., Kajjari, N. B. & Kurtakoti, F. B. Improved* Yanigar jowar, *a* rabi *variety for Dharwar district.* (*pp. 87–90*).

Selections Y–417–5 and Y–2 of the local winter sorghum Yanigar give high yields of both grain and forage.

A male-sterile plant has been found in this variety; the production of F_1 hybrids with the aid of this source of male sterility is to be attempted.

3338 *Patel, P. L., Patel, R. M. & Patel, R. A. S–1049 an improved type of forage* Sorghum. (*pp. 91–98*).

The Sundhia type of sweet sorghum shows considerable variability in panicle characters. Of the selections of this type developed at the Institute of Agriculture, Anand, strain 1049 has shown most promise, with approximately 20% superiority in forage yield, earlier maturity and several other improvements compared with local Sundhia.

3339 *Argikar, G. P. A brief review of work on breeding for drought resistance.* (*pp. 110–14*).

This review of some of the literature stresses the desirability of initiating breeding for drought resistance.

3340 *Naik, M. S. & Abhyankar, V. S. Nutritive value of improved strains of* jowar (Sorghum vulgare, *Pers*). (*pp. 130–37*).

Data are given on the nutritive properties of 9 improved and 7 local varieties.

3341 *Pandya, P. S., Chavan, V. M. & Shendge, P. Y. A brief review of the improvement of* bajri [Pennisetum typhoides (*Burm.*) *Stapf. and Hubb.*] *in Bombay State.* (*pp. 142–47*).

Breeding has been centred at Niphad, where selections inbred for 3–5 years have been further developed by "group breeding" involving sibbing, the undesirable effects of continuous inbreeding thus being avoided. Promising group-bred cultures are maintained by controlled mass pollination. Crosses of continuously inbred lines have not shown as much hybrid vigour as crosses of group-bred selections. Intervarietal hybridization has also provided material for group breeding. The F_1 hybrid 28–15 x AF–3 has outyielded local bajri by 25%. Suitably modified, Harland's method of improving maize is being applied to this crop.

3342 *Chavan, V. M., Patil, J. A. & Chaudhari, B. B. Hybrid* bajri *in Bombay State.* (*pp. 148–50*).

In field tests, the F_1 hybrid 28–15–1 x AF–3–G–1–G–1 gave on the average a 10% higher yield of grain than the standard selection 28–15–1 (cf. Abst. 3341). Mixing seed of the two parents in equal proportions, combined with cultivation at closer spacing than normal, offers a practical means of commercial production of hybrid seed. A scheme employing this procedure has been initiated to supply the Nasik district.

3343 *Patil, P. K. & Patil, S. M. Need for research on* bajri *in Bombay State.* (*p. 156*).

An attempt to induce male-sterile lines by X rays and other mutagens, to facilitate the development of F_1 hybrids, is among the investigations advocated.

3344 *Pandya, P. S., Chavan, V. M. & Shendge, P. Y. Review of research work on small millets in Bombay State.* (*pp. 172–74*).

Selection has resulted in improved strains of *E. coracana, Paspalum scrobiculatum, Panicum miliaceum* and *S. italica.*

3345 *Chavan, V. M., Gopalkrishna, N. & Khadilkar, B. T. Blooming and anthesis in* nagli (Eleusine coracana (*Linn.*) *Gaertn.*) (*pp. 175–79*).

The flowering habits of the medium-late strain E–31, as observed at the Agricultural Research Station, Karjat, are described. Flowering is at its maximum at 8.00 hr., when the humidity is highest (95–99%) and the minimum and maximum temperatures are 70–74° and 76–87° F. respectively. Flowering continues up to 10.00 hr. The anthers shed their pollen approximately 45 min. after their first appearance.

3346 *Majmudar, J. V. & Khunte, P. D. Improved strains of* kodra (Paspalum scrobiculatum *Linn.*) *for Gujarat.* (*pp. 183–85*).

The high-yielding strains 494–1 and 80–2 show promise for northern Gujarat.

3347 *Krishnaswamy, N. Origin and distribution of cultivated plants of South Asia; Millets.* (*pp. 195–214*).

This survey, incorporating the results of investigations at the Agricultural Research Institute, Coimbatore, Madras, is reprinted from the article summarized in *PBA*, XXII, Abst. 1729.

3348 ACHUTHA VARIER, U. & DIVAKARAN, K.
A high-yielding white-grained ragi.
Madras agric. J. 1956 : **43** : 73–76.

The high-yielding white-grained strain EC4310 of *Eleusine coracana* has been developed from EC1540 x EC985 at the Millet Breeding Station, Coimbatore, Madras. The parent EC1540 is a low-yielding, white-grained strain with a high vitamin-B_1 content, originating from white-grained EC1008 x a brown-grained type. EC985 is a high-yielded brown-grained strain. EC4310 has a protein content of 8·4% whereas that of the brown-grained standard Co.1 is 7·5%.

3349 LYSAK, S. A.
(**Obtaining intervarietal hybrids of millet by means of open pollination**).
Agrobiologija (Agrobiology) 1956 : No. 1 : 132–34. [Russian].

At Veselyĭ Podol each variety used as seed parent was sown in a field surrounded by another variety and the stamens were removed from its flowers before the flowers opened fully. The plants were then left to open pollinate. The percentage of fertilization for 19 unspecified crosses averaged 31·7% over three years. This compares favourably with percentage fertilizations obtained in artificial crosses. The percentages of hybrids among all F_1 plants were 47·1% in 1952, 54·6% in 1953 and 66·8% in 1954. Appreciable differences in this respect were observed between different sets of components, with Kazanj 506 x Veselyĭ Podol 367 giving an all-hybrid progeny.

3350 RAMAKRISHNAN, T. S. & SUNDARAM, N. V.
Further studies on *Puccinia penniseti* Zimm.
Proc. Indian Acad. Sci. 1956 : **43** : 190–96.

Only culture 814/3 of cumbu (*Pennisetum typhoides*) displayed a high degree of resistance to rust (*Puccinia penniseti*) in both the field and greenhouse at the Millet Breeding Station, Coimbatore, Madras. An attempt is being made to introduce the rust resistance of *Pennisetum purpureum* into cumbu. Increase in the number of chromosomes from the susceptible species in various hybrid combinations is however associated with increased susceptibility. Two races of the pathogen have been distinguished.

3351 ENDRIZZI, J. E.
Chromosomal interchanges and evidence for duplication in haploid *Sorghum vulgare* Pers.
Diss. Abstr. 1955 : **15** : Publ. No. 14, 190 : p. 2389.

A haploid plant of *S. vulgare* ($n = 10$) was isolated from the F_1 of *S. vulgare* 'Texas Blackhull kafir' ♀ x *S. arundinaceum* ♂. Single bivalents were observed in the pollen mother cells, the other chromosomes being univalents. The haploid was pollinated by Texas Blackhull kafir. In 26 of the 29 F_1 plants obtained, meiosis was regular. A heterozygous reciprocal translocation was present in one of the three remaining meiotically irregular plants. Its origin is attributed to crossing over in interstitial duplicate regions of two partially homologous chromosomes during megasporogenesis in the haploid. Another of the atypical plants provided evidence of a gross structural change in one chromosome arm. This alteration is interpreted as the loss of most of the long arm of a heterobrachial chromosome by crossing over in the duplicate segments of two otherwise nonhomologous chromosomes of the haploid. The occurrence of a centric fragment, low frequency of ring bivalents and complete sterility of this plant indicate the occurrence of several structural rearrangements in the chromosomes of the haploid parent. The third atypical individual was trisomic. The evidence of duplication is in agreement with previous suggestions that *S. vulgare* had an allopolyploid origin.

RICE

3352 Piacco, R.
Le razze di riso coltivate in Italia. (**The rice varieties cultivated in Italy.**)
Quad. Staz. sper. Risic. Vercelli 1954 : No. 38 : Pp. 145.

A full historical account is given of the rice varieties grown in Italy from the early part of the nineteenth century, when only one kind was known, up to the present day. All the varieties that have been introduced and tested are listed, with information on their behaviour. From this it is seen that climatic analogies, mean temperature sums and even the behaviour of Italian varieties in the country of origin give no reliable guide to the success to be expected from introducing a variety from any particular locality; with one or two exceptions, such as Chinese Originario, none of the varieties introduced from abroad has been a success. Hybridization was begun as early as 1902 but was performed successfully only after a technique of emasculation was worked out in 1912. Some 40 Italian and 30 imported varieties have been used as parents and are enumerated, indications being given of their desirable characters; a list is given also of the various parental combinations made. Crosses performed after electromagnetic treatment of the seed gave results identical with those from untreated pollen. Height of plant behaved in all crosses as a polymeric character, as did awn production, coloration, shape and size of grain, and vegetative period. Awning and violet pigmentation behaved as dominant characters and certain characters, such as short straw and short grain, were indivisibly associated.

An outline of a classification of the species *Oryza sativa* into subspecies, proles and botanical varieties, based on Guščin (cf. *PBA*, XV, p. 290) and modified by the author, is presented, together with a key for the identification of the varieties. There follows a chapter in which 23 varieties at present cultivated in Italy are described and illustrated; common synonyms and origin are indicated and information is given on the areas in which each variety is cultivated.

No superior mutants have been obtained by treatments with X rays, ultraviolet rays, low temperature, various gases, including ozone, or white light at high intensities.

3353 Piacco, R.
L'introduzione del "Bertone" in Italia. (**The introduction of Bertone into Italy**).
Riso, Milano 1956 : **5** : No. 5 : 22–24.

Newly discovered information is cited showing that the rice variety which came to be known as Bertone was introduced into Italy from Cochinchina in the first quarter of the nineteenth century, probably about 1820.

3354 López-Ríoboo Tenreiro, F., Oyanguren y Garcés de Marcilla, J. & Prieto Heraud, E.
Ensayos comparativos de variedades de arroz. (**Comparative tests of rice varieties**).
An. Inst. nac. Invest. agron. Madr. 1955 : **4** : 405–84.

In connexion with the new register of plant varieties in Spain, tests were made in representative zones with 16 rice varieties, Benlloch serving as control in each case. Those that consistently exceeded the control in yield were Balilla, Benlloch x Omachi, Precoz verde [Green Early], Puebla Larga [Long grain] and Americano 1600. All the varieties with grain of the highest quality were inferior to Benlloch in yield. Certain other varieties yielded well in some zones and not in others.

3355 Marie, R. & Denoy, I.
État actuel de l'amélioration des variétés de riz en France. (**Present state of breeding rice varieties in France**).
Riz et Rizic. 1956 : **2** : 179–87.

The first part of this article on the experimental rice plantation at Le Merle (cf. Abst. 446) gives brief descriptions of rice varieties currently grown in France and outlines immediate breeding aims. The second part presents the results of variety trials of Italian, Spanish, Bulgarian and Japanese introductions and gives the preliminary results of intervarietal crosses carried out at the station. Crosses between short-grained and long-grained varieties resulted in a large degree of sterility in the F_1; this semi-sterility was particularly noticeable in the crosses Balilla x Sesia, Balilla x Senatore Novelli, Adelaide Chiappelli x Eiko and Sesia x Eiko.

3356 Tinarelli, A.
Che cosa è l'Americano 1600? (**What is Americano 1600?**).
Riso, Milano 1956 : **5** : No. 4 : 20–24.

The rice variety in question was imported into Italy from Japan at the beginning of this century and became known as Originario; in America it came to be known as Colusa 1600 and this, on returning to Italy, received the designation Americano 1600. By selection it has given rise to a number of derivatives, which include Sancino, Roverbella and Onsen. The variety is still genetically mixed and six distinct types that have been separated from it are described. Differences have also been established between commercial lines of the variety obtained from different sources. Some indications are given as to the types most desirable from the point of view of growers and consumers.

3357 T., A.
La razza Corbetta. (**The variety Corbetta**).
Sementi elette 1956 : **2** : No. 4 : p. 53.

This rice variety, a mutant from Franco Roncarolo, is described as resistant to lodging and diseases, high yielding and early in flowering, though it matures slowly and its grains are slightly flecked.

3358 Kung, P.
Progress report on rice breeding and seed multiplication works in Taiwan, 1954.
News Lett. FAO Internat. Rice Comm. 1955 : No. 14 : 11–12.

Breeding is in progress at eight stations and is concerned with the improvement of Ponlai varieties and, in localities where they are of economic importance, of upland and round glutinous varieties, with the selection of native material and with breeding for blast resistance and other diseases. Seed of the various rice types is being multiplied.

3359 Jodon, N. E.
Sunbonnet and Toro, two new mid-season, long-grain rice varieties.
Bull. La. agric. Exp. Sta. 1955 : No. 499 : Pp. 11.

The above varieties, selected from Bluebonnet (Rexoro x Fortuna) and 4–II–8–14 [(Rexoro x Blue Rose) x Rexoro] x Bluebonnet respectively, are described in detail (cf. Abst. 2352).

3360 **Rice breeding in Surinam.**
News Lett. FAO Internat. Rice Comm. 1956 : No. 17 : 17–18.

Resistance to lodging and improved grain quality are the chief objectives. The programme of crossing the high-yielding local variety Skrivimankoti with introductions from the USA has resulted in DIMA (VD5096 or VD5096/25), released in 1955. Its chief features are high yield, stiff short straw, good quality and a low degree of photoperiodic sensitivity. It is suitable only for rich heavy soil. The new lines VD5096/69, VD5096/73, VD52394, VD52470, SML77/4/4/5 and SML77/5/10/2 show promise of superiority over DIMA. Material has also been obtained from crosses of VD lines with the long-grained variety Ghent from Madagascar.

3361 GanguLee, H. C.
Rice anthocyanin genetics. I. Review of anthocyanin genetics in general.
Portug. acta biol. 1955 : Sér. A. : **4** : 99–134.

The author reviews the literature on the genetics of anthocyanin pigmentation in rice in the light of the results obtained for other plants, e.g. the cereals, *Gossypium* spp., flax and ornamental species. He concludes by giving provisional linkage maps for the relevant genes in rice.

3362 (**Statistical genetic studies on quantitative characters in rice**).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 177, 206. [Japanese].

A synopsis is given of recent, mainly Japanese, papers on the above topic.

3363 GanguLee, H. C.
Anthocyanin genetics in plants with special reference to rice (*Oryza sativa* L.)
Bull. bot. Soc. Beng. 1954 : **8** : 156–67.

After a survey of the genetics of anthocyanin pigmentation in jute, cotton, maize and a number of ornamental species, current knowledge of the inheritance of pigmentation in the flower organs, stems, leaves and other plant parts of rice is reviewed and maps showing the probable positions of genes in the six known linkage groups are presented.

3364 OKA, H.
(Changes in gene frequency in hybrid populations of rice. Phylogenetic differentiation of cultivated rice. XI).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 207–12. [Japanese].

This number of the series (cf. Abst. 2403) opens with a theoretical analysis of the shift in gene frequency at a single locus to be expected from gametic selection and different rates of multiplications. The results are applied to data obtained on F_2–F_7 gene frequencies of the loci *Cc* (apiculus pigmentation), *Rcrc* (testa pigmentation), *Glgl* (normal *v.* glutinous endosperm) and *Phph*, phenol reaction.

3365 HAMADA, H.
(The distribution of Japanese red rice and its characteristics).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **24** : 147–48. [Japanese].

Two varietal groups are distinguished, a long-grained *indica* group, originally occurring in southern and central Japan, and a short-grained *japonica* group, formerly confined to northern and central Japan.

3366 PORTÈRES, R.
Nouvelles variétés agrobotaniques de riz cultivés, *Oryza sativa* L. et *O. glaberrima* St. **(New agrobotanical varieties of cultivated rices, *O. sativa* L. and *O. glaberrima* St.).**
J. Agric. trop. Bot. appl. 1955 : **2** : 573–99.

Morphological descriptions of 70 new botanical varieties of *O. sativa* and 41 new botanical varieties of *O. glaberrima* are provided together with information on their geographical origin.

3367 MASIMA, I. & UCHIYAMADA, H.
(On improvement in fertility in autotetraploid rice).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 163–66. [Japanese].

A large number of induced tetraploid strains of rice varieties, intragroup hybrids and intergroup hybrids were compared with their diploid progenitors in respect of fertility. By group is meant the three compatibility groups established by Terao and Mizushima. Improvement in fertility was most marked in the intergroup tetraploids, especially the I × III combination. The improvement in fertility could largely be accounted for by reduction in quadrivalent frequency.

3368 YAMADA, N., MURATA, Y., OSADA, A. & IYAMA, J.
Photosynthesis of rice plant. II.
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **24** : 112–18.

A comparative study of photosynthetic rate in 12 varieties with different agronomic characteristics is reported. Considerable intervarietal differences in rate were noted, the adaptable variety Norin 1 [Ministry of Agriculture and Forestry 1] having the highest rate. Photosynthetic rate was highly correlated with the percentage water content of the fresh leaves.

3369 GANGULEE, H. C.
Studies on the date of ear emergence in rice. I. Relation between sowing time and date of ear emergence.
Bot. Gaz. 1955 : **117** : 1–10.

In experiments at Calcutta, India, the aman (autumn and winter) varieties tested formed a distinct group with a short-day requirement. In contrast, the other varieties tested at Calcutta and also in Arkansas, and consisting of representatives of both *indica* and *japonica* rice, comprised a heterogeneous group with respect to photoperiodic reaction. Small-grained short *japonica* varieties were highly sensitive to short days, other varieties, such as Nira and Fortuna, were less sensitive, and still others, such as most aus (summer) varieties, were day-neutral. One variety, Karang Serang from Java, appeared to be a long-day type.

3370 MORINAGA, T. & KURIYAMA, H.
Japonica type rice in the subcontinent of India and Java.
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 149–53.

This paper is the full version of the one summarized in Abst. 2367.

3371 MIZUSHIMA, U., MURAKAMI, K. & HOZYO, Y.
(On the influence of abnormal environmental conditions on embryogenesis in rice. I. Histochemical observations on normal embryogenesis).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 154–62. [Japanese].

As a preliminary to investigating the effect of abnormal conditions on embryogenesis, the authors describe the course of normal embryogenesis and the accompanying biochemical changes affecting nucleic acid, polysaccharides, acid phosphatase and peroxidase.

3372 NAGAMATSU, T. & ISHIKAWA, F.
(Studies on the geographic distribution of cultivated rice. IX. Studies on variation in glume-hair density and its geographical distribution).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **24** : 185–87. [Japanese].

A world collection of 1251 varieties was examined and classified into 7 groups in respect of glume-hair density. Varieties with the densest hairs came from northern latitudes. The Philippine varieties had no or very few hairs.

3373 PORTÈRES, R.
Les souches génétiques du riz et le problème de leurs affinités. **(Genetic stocks of rice and the question of their relationships).**
Riz et Rizic. 1956 : **2** : 175–78.

It is claimed that the FAO world catalogue of genetic stocks of rice (cf. *PBA*, XX, Abst. 2351) is incomplete in that it tends to ignore morphological characteristics and provides little indication of the relationship between different cultivated varieties. It is therefore suggested that varietal appellations similar to those used by agrobotanists for other crops should be introduced to provide an intraspecific taxonomy which, it is thought, would prove invaluable to all concerned with the breeding, systematics and cultivation of rice.

3374 PORTÈRES, R.
Un riz précoce estimé en petite culture dans l'Ouest-Africain: le Toulou-oule ou Konko (*O. sativa* L.) **[Toulou-oule or Konko (*O. sativa* L.), an early variety valued for small-scale cultivation in West Africa].**
J. Agric. trop. Bot. appl. 1956 : **3** : 50–59.

The above-named variety, which is cultivated on the coast of Sierra Leone between Freetown and Sherboro Island, is described. It is popular because of its high yields, early maturity and the whiteness of its grain but, as it does not keep well, it is suitable only for domestic consumption.

3375 PORTÈRES, R.
Présence ancienne d'une variété cultivée d'*Oryza glaberrima* St. en Guyane Française. **(Early existence of a cultivated variety of *O. glaberrima* in French Guiana).**
J. Agric. trop. Bot. appl. 1955 : **2** : 681–83.

The majority of the rice varieties grown in French Guiana originate from the Philippines and appertain to *O. sativa* (cf. *PBA*, XIX, Abst. 1822). In this article the author reports the discovery of a variety of *O. glaberrima* closely akin to a variety commonly grown in the western forest region of the Ivory Coast and suggests that it was introduced into French Guiana in the eighteenth or nineteenth century.

3376 FUJII, Y. & TANAKA, N.
(On differences in the amount of oxygen dissolved in water absorbed by rice as related to the length of the maturation period).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **24** : 95–96. [Japanese].

A comparative study of the absorption of oxygen by the roots of 14 Japanese varieties is presented. Late varieties absorbed oxygen more rapidly than early varieties.

3377 WADA, K.
(On the number of vascular bundles of the coleoptile as a characteristic of rice varieties from cool regions).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **24** : 159–60. [Japanese].

Varieties from Tohoku, the northern part of the main island of Japan, have 2·0–2·1 vascular bundles in the coleoptile. In varieties from Hokkaido and in Soviet varieties, the number of bundles is 2·0–3·6.

3378 YAMADA, N. & OTA, Y.
(Varietal differences in the resistance of rice to submersion under water).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **24** : 151–53. [Japanese].

Varietal differences in a series of Japanese varieties are reported. Resistance is correlated with total carbohydrate content, starch content and total carbohydrate/respiration rate but not with sugar or nitrogen content.

3379 SAMPIETRO, G.
La nuova varietà di riso "Roverbella". **(The new rice variety Roverbella).**
Ann. Staz. sper. Risicolt. Colt. irrig. 1954 : **2** : 229–35.

The variety is derived from a cross of Precoce 6 [Early 6] x Precoce 9 made in 1938 and is described as midearly, low in stature and resistant to lodging; it yields well and is free from shedding, its grain being similar to that of Precoce 6.

3380 La razza Roverbella. (**The variety Roverbella**).
Sementi elette 1956 : **2** : No. **4** : 53–54.
Cf. Abst. 3379.

3381 La razza R.3. (**The variety R3**).
Sementi elette 1956 : **2** : No. **4** : 54–55.
This rice variety is described as being highly resistant to lodging.

3382 HUGUET, F. & BORDAS, J.
Étude de la variété japonaise de riz "Thiroku". (**Study of the Japanese rice variety Thiroku**).
Ann. Inst. nat. Rech. agron., Paris : Sér. A : 1955 : **6** : 759–61.
In trials at Avignon, France, a Japanese rice referred to as Thiroku matured some five weeks earlier than Balilla and gave yields comparable with those of this variety. Thiroku was highly resistant to lodging and shedding and produced grain of good quality.

OTHER CEREALS

3383 PORTÈRES, R.
Les céréales mineures du genre *Digitaria* en Afrique et en Europe. (**The minor cereals of the genus *Digitaria* in Africa and Europe**).
J. Agric. trop. Bot. appl. 1955 : **2** : 620–75.
A catalogue of edible varieties of *Digitaria exilis* is given, together with brief botanical descriptions and notes on the vernacular names of those species grown in West Africa (cf. Abst. 2421).

FORAGE GRASSES

3384 BEDDOWS, A. R.
Better grasses—a review of progress.
Agric. Rev., Lond. 1956 : **1** : No. **8** : 37–43.
An account of pioneer work in the development of improved strains of herbage grasses in Great Britain and other countries is followed by an outline of some of the methods used in present-day breeding.

3385 **Nomenclature of herbage plants.**
Agric. Res. Counc., London, undated: Pp. 4. (Mimeographed).
A technical group was convened by the Agricultural Research Council of the United Kingdom, in conjunction with the Commonwealth Bureaux of Plant Breeding and Genetics and of Pastures and Field Crops, to consider the problems of the nomenclature of herbage plants. This publication gives the proposals of the group concerning a standardized system of nomenclature, in conformity with the International Code of Nomenclature for Cultivated Plants, for use in the United Kingdom and for the provision of a basis for a national register of cultivars.

3386 SCHIEBLICH, J.
Futterpflanzenneuzüchtungen. 1. Inkarnatklee, Hornklee, Sumpfrispe. (**New strains of forage plants. 1. Crimson clover, birdsfoot trefoil and *Poa palustris***).
Dtsch. Landw., Berl. 1956 : **7** : 166–70.
Bernburger Inkarnatklee [Bernburg crimson clover], a new strain selected at the Bernburg Plant Breeding Institute, Eastern Germany, from Hungarian material, is distinguished by its high leaf yield combined with good seed production; this combination is not, however, fixed and continuous selection is necessary. The new strain also possesses improved winter hardiness and a vigorous growth habit. Bernburger Hornklee [Bernburg birdsfoot trefoil] was developed by mass and individual plant selection from local wild material. It is characterized by rapid initial growth, hardiness, resistance to drought and ability to flourish on the poorest of soils. It gives exceptionally high yields of green matter and the seed yield is comparatively good. Further selection to improve resistance to shedding is being undertaken. Saaletal [Saale Valley], a new strain of *P. palustris*, is intended for low-lying marshy areas; it is extremely winter hardy and is tolerant of saline soils.

3387 HUNT, I. V.
Comparative productivity of 27 strains of grass in the west of Scotland. Part I. Total production for three years.
J. Brit. Grassl. Soc. 1956 : **11** : 49–55.
Tests were carried out on 1 tall fescue, 1 rough-stalked meadow-grass, 11 perennial ryegrass, 6 timothy, 5 cocksfoot and 3 meadow-fescue strains in sowings with white clover. New Zealand perennial ryegrass and the tall fescue strain were the most productive in terms of dry matter, crude protein and starch equivalent.

3388 **List of grassland ecotypes collected by FAO in 1954 and 1955 in the natural vegetation of the Mediterranean region and the Near East. Part I. List of species. Part II. Collection data.**
FAO UN, Rome 1955 : FAO/55/12/8599–600 : Pp. 5 and 93. (Mimeographed).
Part I lists the species represented among the 833 ecotypes obtained. These collections have been

numbered FAO–3001 to FAO–3833. Part II provides information on the localities of the collections and their rainfall, altitude and soil, together with miscellaneous comments.

3389 Schwendiman, J. L.
Improvement of native range through new grass introduction.
J. Range Magmt. 1956 : **9** : 91–95.

A short account is given of the work of the US Soil Conservation Service in connexion with the introduction of native selections and imported varieties for the western states, mainly with reference to *Agropyron* spp., *Festuca ovina*, *Poa* spp., *Elymus junceus* and *Bromus* spp.

3390 Solberg, P.
Forsøk med luserne, kløver og grasvekster. (**Trials of lucerne, clover and grasses**).
Forskn. Fors. Landbr. 1956 : **7** : 129–82.

Data are given on combined strain and fertilizer trials conducted at Løken and the mountain district of Skjåk, Norway, over the period 1948–53. The Canadian variety Grimm was the most productive of the three lucernes tested and the Norwegian variety Molstad the best of the red clovers. The timothy strain Vågønes I generally outyielded the other timothy varieties and the other grass species tested. Within each species, intervarietal differences in response to fertilizers were slight.

3391 Manner, R.
Hammenhögs Golfängsgröe (**The Hammenhög meadow-grass Golf**).
Medd. Gullåkers VäxtförädlAnst., Hammenhög 1954 : Nos. 10–11 : 282–89.

Recommended chiefly as a turf grass, Golf has also proved useful as a forage crop with white clover, giving a lower total yield than Gullåker and Skandia II but equal or higher yields in the second, third and fourth cuts. The variety was developed from local wild material at Hammenhög.

3392 Thompson, J. R. & Seaton, R. D.
Spaced-plant trials at East Craigs. II. Strains of timothy, *Phleum pratense*, L. 1951–1954.
J. Brit. Grassl. Soc. 1956 : **11** : 86–92.

In a study of 18 strains at East Craigs, Edinburgh, Scotland, date of ear emergence was associated with growth habit at ear emergence and at flowering, plant weight at flowering, amount of aftermath shooting, and to a lesser degree, spring-growth habit (cf. Abst. 3398). Except for Drummond, the strains could be classified into three groups, with time of flowering as the chief differentiating character.

3393 Staten, R. D., Watts, V. M. & Thurman, R. L.
Sunturf—a new lawn Bermuda grass.
Arkans. Fm. Res. 1956 : **5** : No. 1 : p. 5.

Cynodon magennisii, a sterile triploid plant resulting from a cross between *C. dactylon* and *C. transvaalensis*, has been introduced into the USA from South Africa and is being released under the name Sunturf. It forms thick turf and is very tolerant of drought.

3394 Schulz-Schaeffer, J.
Cytologische Untersuchungen in der Gattung *Bromus* L. (**Cytological investigations in the genus *Bromus* L.**).
Z. Pflanzenz. 1956 : **35** : 297–320.

The results of experiments carried out at the Max Planck Institute for Breeding Research, Neuhof, Germany, on the chromosome numbers, chromosome morphology and meiotic behaviour of 23 species belonging to the sections *Festucaria*, *Eubromus*, *Serrafalcus* and *Ceratochloa* and of three species, *B. scabratus*, *B. popovei* and *B. arizonicus*, that could not be classified under sections, are presented. The following chromosome numbers are reported for the first time: *B. pendulinus* and *B. popovei*, $n = 28$; *B. scabratus*, $n = 14 + 4$. In addition, chromosome numbers differing from those hitherto reported in the literature are given for the following: *B. macranthus* and *B. cappadocicus*, $n = 28$; *B. sterilis*, *B. adoensis*, *B. lanceolatus*, *B. mollis*, *B. japonicus* and *B. racemosus*, $n = 14$. The length of the chromosomes, the position of the centromeres, chromosome configurations and shape and morphology of the chromosomes were studied during diplotene and diakinesis in each species and the findings are presented in tabular form. The structure of the satellite chromosomes of *B. inermis* showed a pronounced similarity to those of *B. adoensis* and *B. japonicus*, while the structures of the satellite chromosomes of *B. ciliatus* and *B. carinatus* also displayed a certain likeness. Bivalent pairing was complete or almost complete in most of the diploid species examined; *B. inermis*, *B. rigens* ssp. *maximus*, *B. arvensis*, *B. secalinus*, *B. racemosus* and *B. popovei* displayed certain irregularities, including lagging chromosomes. Quadrivalent formation in *B. secalinus*, *B. japonicus*, *B. adoensis* and *B. pendulinus* was attributed to the occurrence of reciprocal translocations. Marked similarities were observed between the caryotypes of *B. carinatus* and *B. japonicus* and it is postulated that the two species are closely related. *B. japonicus*, *B. adoensis* and *B. scabratus* are thought to be allopolyploids on the basis of the morphology of their chromosomes. Supernumerary chromosomes were found in *B. inermis* ($n = 21 + 10$), *B. erectus* ($n = 21 + 4$), *B. cappadocicus* ($n = 28 + 2$) and *B. scabratus* ($n = 14 + 4$).

3395 RAEBER, J. G. & KALTON, R. R.

Variation and inheritance of fertility and its components in *Bromus inermis* Leyss.

Agron. J. 1956 : **48** : 212–16.

Twenty S_0 clones selected from the varieties Fischer, Lincoln and Achenbach and their S_1 families were studied with respect to percentage of fertility $\left(\frac{\text{weight of clean seed}}{\text{panicle weight}} \times 100\right)$, number of florets per panicle and number of germinable seeds per panicle at the Iowa Agricultural Experiment Station (cf. *PBA*, XXV, Abst. 1129). Differences among the S_0 clones in the three attributes were highly significant in each of the two years of evaluation. Most S_1 families showed marked decreases in fertility percentage and number of germinable seeds per panicle compared with the S_0 parents. S_1 plants from S_0 clones with a high floret number showed a slight reduction in this respect, whereas S_0 parents with low numbers gave rise to S_1 plants with the same or slightly increased numbers of florets. All families provided evidence of genetic segregation for the attributes studied. Estimates of heritability for the three attributes were only moderately high, possibly as the result of the small size and number of the S_1 families used to make the estimates, non-additive gene action and other factors. Fertility percentage was strongly associated genetically with number of germinable seeds per panicle but showed no correlation with floret number.

3396 SORENSEN, E. L.

Factors affecting pollen germination and interrelations of pollen characters and fertility in smooth bromegrass (*Bromus inermis* Leyss): Part I. Factors affecting pollen germination. Part II. Interrelations of pollen characters and fertility.

Diss. Abstr. 1955 : **15** : Publ. No. 14,742 : 2378–79.

Experiments were carried out on the effects of various conditions on pollen germination and pollen-tube growth. Of the media tested for their effectiveness for pollen germination, a sucrose-agar medium proved the most suitable, good germination being obtained with 2% agar + 25% sucrose at pH 5·5 and 28° C. Significant variations were detected among individual plants with respect to percentage of normal pollen and capacity to set seed when open pollinated; positive and highly significant interannual correlations suggested that these properties were heritable. Average seed setting under parchment bags was 2·6%, in contrast to the average of 64% with open pollination. Pollen germinability was positively and significantly associated with pollen normality, self fertility and cross fertility; pollen normality was correlated with cross fertility, and self fertility with cross fertility.

3397 HUNT, I. V.

Comparison of production from six strains of perennial ryegrass.

Res. Bull. W. Scot. Coll. Agric. 1956 : No. 13 : Pp. 55.

A detailed report is given of a trial of the Ayrshire, Irish, Devon Eaver, New Zealand, Kent and S23 strains in a split plot randomized block layout with manurial treatments at Auchincruive, Ayrshire. New Zealand ryegrass proved to be the strain giving the highest yields of dry matter and crude protein; its seasonal growth was well distributed. It is however suggested that under experimental conditions more favourable to S23 it would be capable of ranking as the best strain.

3398 THOMPSON, J. R. & SEATON, R. D.

Spaced-plant trials at East Craigs. I. Strains of perennial ryegrass, *Lolium perenne*, L., 1951-1954.

J. Brit. Grassl. Soc. 1956 : **11** : 34–41.

In trials of 13 strains at East Craigs, Edinburgh, Scotland, a general relationship was found between earliness on the one hand, as measured by date of ear emergence, and growth habit at ear emergence and at flowering, stem length and plant weight at flowering and amount of aftermath shooting on the other. Earliness was not however related to growth habit in spring. The strains were assigned to grades in respect of each of the above-mentioned characters. In an overall classification, they fell into two main groups on the basis of relative earliness or lateness.

3399 COOPER, J. P.

A rapid technique for strain identification in the ryegrasses.

J. Brit. Grassl. Soc. 1956 : **11** : 42–47.

Details are given of a rapid greenhouse technique for the identification and classification of strains, based on differential response to vernalization at 50–60° F.

3400 Lehmann, U.
Das Deutsche Weidelgras, seine Zuchtformen und deren Futterleistung unter verschiedenen Bedingungen der Nutzung und Düngung. (Ryegrass, its cultivated forms and their fodder yields under different conditions of exploitation and manuring).
Saatgutwirtschaft 1956 : **8** : 77–80: 110–112.

Data are presented on the hay yields, dry matter, fibre and crude protein contents, reaction to different levels of fertilizer, persistence and recovery after grazing of three north German strains and five unspecified foreign varieties of *Lolium perenne*. In Schleswig-Holstein, where the trials were held, the German varieties gave the best performances. Early-maturing forms had higher fodder values and also produced more seeds than late-maturing forms but the latter group derived greater benefit from the application of artificial fertilizers.

3401 Saeed Quadri, S. W.
Recognition of ryegrass species and strains in the seedling stage.
Emp. J. exp. Agric. 1956 : **24** : No. 93 : 27–36.

The identification of *Lolium* spp. and strains by means of seedling characters at the Welsh Plant Breeding Station, Aberystwyth, is described. The classification of species according to seedling characters proved to be consistent with that proposed by Jenkin and Thomas on the basis of adult morphology (cf. *PBA*, VIII, Abst. 701).

3402 Rutherford, A. A.
The susceptibility of perennial ryegrass to blind seed disease. [*Gleotinia temulenta* (Prill. and Delacr.) Wilson, Noble and Gray].
J. Brit. Grassl. Soc. 1956 : **11** : 66–70.

Data obtained in 1952–54 from trials of 8 strains at Loughry Agricultural College, Cookstown, N. Ireland, indicate that (1) Irish Commercial and Devon Eaver are less susceptible than pedigree strains of various origins, (2) that a highly significant correlation exists between degree of infection and percentage germination, although blind-seed disease is probably not the only factor affecting this percentage and (3) in general late strains are more liable to attack than early.

3403 Bosemark, N. O.
On accessory chromosomes in *Festuca pratensis*. III. Frequency and geographical distribution of plants with accessory chromosomes.
Hereditas, Lund 1956 : **42** : 189–210.

The frequency and geographical distribution of plants with accessory chromosomes in natural populations in Sweden and to a lesser extent in England and Wales were studied (cf. *PBA*, XXV, Absts. 1132–3). Accessories were found in the entire range of distribution of the species in Sweden but the frequency of plants carrying them differed according to the area. Except in Skåne, the frequency of such plants was positively correlated with the clay content of the soil. The varying frequencies and this correlation are explained mainly on the basis of ecological preferences. Size and density of wild and naturalized populations, the extent of cultivation and frequency of plants with accessories in the commercial strains used, nondisjunction and meiotic elimination are also considered to play an important part in determining differences in frequency. The selective value of accessories in *F. pratensis* is discussed in the light of information on accessories in species of other genera. Swedish commercial strains investigated contained accessories in varying numbers. In the material collected in Britain the overall frequency of accessories was much lower and showed no marked correlation with ecological factors. All old and well-established populations lacked accessories or carried them with such a low frequency that they did not appear in the samples. Among the few populations containing accessories, those with the higher frequencies were the youngest. It is suggested that the material originally invading old meadows and pastures in Britain possessed few or no accessories and that increase in the frequency of accessories through the more recent introduction of plants containing such chromosomes has been restricted by the competitive advantage of the highly adapted populations already established.

3404 Bosemark, N. O.
On accessory chromosomes in *Festuca pratensis*. IV. Cytology and inheritance of small and large accessory chromosomes.
Hereditas, Lund 1956 : **42** : 235–60.

Investigations were carried out on four derivatives of the standard type of accessory, three being smaller than the standard type and the fourth larger. Two of the small accessories had each lost the entire right arm, which consists mainly of a large heterochromatic segment. One of these accessories, which was present alone in the mother plant, had completely lost its ability to undergo nondisjunction during the first pollen mitosis. The other was found together with two standard accessories in the mother plant; in the presence of these two standards it showed no impairment of its nondisjunction mechanism in the pollen grains but when alone it did not undergo nondisjunction. The third small accessory was only slightly shorter than the standard type. Its origin from this type involved a deficiency of the end of the left arm and an inversion transferring the centromere from a median to a terminal position. Even in the absence of other accessories, it was able to undergo nondisjunction. The standard type and this small accessory tended however to have a reciprocal effect in promoting efficiency in the functioning of the nondisjunction mechanism. The large accessory, which is an isochromosome, originated from the deficiency-inversion accessory described above through misdivision of the centromere. In pollen grains containing both large and standard accessories, the effectiveness of the nondisjunction mechanism was about double that in grains carrying standards only. The influence of accessories upon each other with respect to nondisjunction is explained on the basis of compensation for shortage or lack of gene products necessary for the full expression of nondisjunction. Univalent large accessories divided at anaphase I, the ends of the daughter chromosomes being directed towards the poles. It is suggested that this behaviour is due to neocentric activity of the chromosome ends and that this activity is connected with the presence of large heterochromatic segments in the accessories. Univalent standards probably also divided in a similar manner but on account of their smallness were difficult to observe.

3405 Hirayoshi, I., Matumura [Matsumura], M., Nozaki, T. & Hayashi, H.
(Studies on breeding sorgo hybrids. I. Some characteristics of the F_1 of sorgo x Sudan grass).
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1956 : No. 6 : 1–5. [Japanese].

A detailed morphological comparison between the above hybrid and its parents is presented. The hybrid showed heterosis in respect of height and leaf length.

3406 Hirayoshi, I., Nishikawa, K., Saito, T. & Sirakane [Shirakane], A.
(Studies on breeding sorgo hybrids. II. Gene segregation in the F_2).
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1956 : No. 6 : 6–11. [Japanese].

The segregation of seven characters in the F_2 of the cross referred to in Abst. 3405 was ascertained. Stalk length, stalk number, stalk diameter and heading period showed continuous variation in the F_2. The distribution curve of the first two characters was slightly leptokurtic; the curves of the latter two characters were skew. Awn length, inflorescence morphology and grain shape were each classified into five categories but their genetic basis was not established.

3407 Hirayoshi, I., Nishikawa, K. & Horiuti [Horiuchi], H.
(Studies on breeding sorgo hybrids. III. The relation between morphology and productivity in the F_2, F_3 and BF_2).
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1956 : No. 6 : 12–20. [Japanese].

Data are provided on the forage yield and various yield components of the F_2 and F_3 of the cross mentioned in Absts. 3405 and 3406, of the F_2 of a cross between another sorgo variety and Sudan grass, of a back cross of the F_2 first mentioned to sorgo and of the parent varieties. The F_2 and F_3 populations were the most productive, but the relative importance of the yield components varied with the cross from which they had originated. Additional merits possessed by the hybrids are good regeneration after cutting, lodging resistance and palatability.

3408 Hadley, H. H. & Mahan, J. L.
The cytogenetic behaviour of the progeny from a backcross (*Sorghum vulgare* x *S. halepense* x *S. vulgare*).
Agron. J. 1956 : 48 : 102–06.

With the aim of transferring some of the desirable characters of Johnson grass to Sweet Sudan grass, the 30-chromosome hybrid Blackhull Kafir x Johnson grass was pollinated with Sweet Sudan grass. Most of the 70 back-cross plants had 20 chromosomes and showed low fertility, with much variation among plants in both fertility and morphological characters. Seed from self-pollinated individuals with 20 chromosomes carrying the Johnson grass rhizomatous character germinated poorly and included many chlorophyll aberrants. Hybrid vigour was shown by many of the back-cross plants and self pollination was followed by a marked loss of vigour. A breeding programme involving the development of pure lines for the production of F_1 hybrids and synthetic varieties is advocated.

3409 Hirayoshi, I., Nishikawa, K. & Kato, R.
(Cytogenetical studies on forage plants. IV. Self incompatibility in *Miscanthus* plants).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 167–70. [Japanese].

Self, intravarietal, intervarietal and interspecific pollinations of *M. sinensis* and *M. tinctorius* were made. All cross combinations set seed; the self-pollinated plants were mostly sterile.

3410 **New Caddo switchgrass is more rust resistant.**
What's New Crops Soils 1956 : **8** : No. 6 : p. 27.

Panicum virgatum 'Caddo', developed at the Oklahoma A & M College Agricultural Experiment Station, is a rust-resistant variety with a high forage yield and good recovery after cutting.

3411 Swaminathan, M. S. & Joginder Nath
B-chromosomes in *Panicum coloratum*.
Curr. Sci. 1956 : **25** : 123–24.

The euchromatic B chromosomes observed in pollen mother cells of *P. coloratum* in investigations at the Indian Agricultural Research Institute, New Delhi, did not pair but divided at either metaphase I or II and also during pollen mitosis, with regular or irregular separation to the poles. They had no effect upon morphology or vigour but the presence of five or more at meiosis II caused irregularities in the separation of the normal chromosomes, leading to 20% pollen sterility in contrast to the 5–10% sterility in plants with fewer B chromosomes. So far B chromosomes have not been observed in root-tip cells.

3412 Snyder, L. A., Hernández, A. R. & Warmke, H. E.
The mechanism of apomixis in *Pennisetum ciliare*.
J. Agric. Univ. PR 1955 : **39** : 150–64.

This article has been summarized from another source in Abst. 1363.

3413 de Wet, J. M. J.
Leaf anatomy and phylogeny in the tribe Danthonieae.
Amer. J. Bot. 1956 : **43** : 175–82.

Species of *Danthonia, Sieglingia, Alloeochaete, Asthenatherum, Pentaschistis, Pentameris, Poagrostris, Schismus, Chaetobromus* and *Prionanthium* are examined with respect to the festucoid or panicoid nature of their leaf anatomy and a further discussion is given of the phylogeny of the above tribe (cf. *PBA*, XXIV, Abst. 3054).

3414 **New side-oats grama soon to be available.**
What's New Crops Soils 1956 : **8** : No. 7 : p. 29.

Coronado, a new variety of *Bouteloua curtipendula*, developed by the US Department of Agriculture and the Oklahoma A & M College, has large seeds and high seedling vigour, produces good stands and is slightly superior to Tucson in forage yield and cold resistance.

3415 Stebbins, G. L. & Snyder, L. A.
Artificial and natural hybrids in the Gramineae, tribe Hordeae. IX. Hybrids between western and eastern North American species.
Amer. J. Bot. 1956 : **43** : 305–12.

"The morphological and cytological characteristics are presented for triploid hybrids between the diploid species *Agropyron spicatum* and four tetraploid species, *A. caninum*, *A. trachycaulum*, *Elymus canadensis* var. *brachystachys*, and *E. virginicus* var. *intermedius*, as well as for the tetraploid hybrids *A. parishii* x *E. virginicus* var. *intermedius* and *E. glaucus* x *virginicus* var. *intermedius*. In external morphology the hybrids were mostly intermediate between their parents, except that *A. parishii* x *E. virginicus* var. *intermedius* was more like *E. virginicus* than *A. parishii*. All the hybrids, though vigorous, were completely pollen and seed sterile. At meiosis, all the hybrids showed a varying amount of chromosome pairing, and indicate that the seven chromosomes in the genome of *A. spicatum* are partly or completely homologous with seven chromosomes in each of the four tetraploid species. The strongest homology is between chromosomes of *A. spicatum* and *A. trachycaulum* as well as *E. virginicus* var. *intermedius*, while the homology between chromosomes of *A. spicatum* and *E. canadensis* var. *brachystachys* is relatively weak. The complexity of the interrelationships between the American species of *Agropyron*, *Elymus*, and related genera is emphasized, and the suggestion is repeated that their cytogenetic and phylogenetic relationships would be best represented if they were all placed in a single genus." [Authors' summary].

LEGUMINOUS FORAGE PLANTS

3416 Kuznecov, V. M.
(The importance of an ecologo-histofical method for studying plants in the natural flora with a view to their introduction).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 20 : 24–29. [Russian].

Introduction work on *Medicago tianschanica* from the Kara Tau mountains, *M. orbicularis* from Dagestan, *Vicia villosa* from Turkmenia, *Agropyron imbricatum* from the Volga Basin and *Polygonum divaricatum* from Transbaïkal is reported from the Principal Botanical Garden and other institutes.

3417 Manner, R.
Undersökningar rörande den nordfranska blålusernens grönmasseavkastning och frösättning. (**Investigations on the yield of green matter and the seed set of lucerne from northern France**).
Medd. Gullåkers VäxtförädlAnst., Hammenhög 1954 : Nos. 10–11 : 268–79.

Two strains, 47–106 and 48–91, from northern France have given very high yields of green matter in tests in Sweden and flower earlier than Grimm. Strain 47–106 gave a better and 48–91 a poorer pod set than Grimm. The possibility of combining high yield of green matter with high seed yield under Swedish conditions is discussed.

3418 Van Slijcken, A. & Van Bogaert, G.
Le choix variétal de la luzerne. (Deuxième communication). [**The choice of varieties of lucerne.** (**Second communication**)].
Rev. Agric., Brux. 1956 : **9** : 399–409.

The indigenous Belgian strain Harmignies, which has been used as breeding material at the National Research Station for Plant Breeding, Melle, Belgium (cf. *PBA*, XXIV, Abst. 391), was compared in small-scale trials at Melle and Steenkerque with varieties from France, Italy, Germany and the USA. The best results were obtained with the French varieties Du Puits, Flandria and Socheville; Harmignies, the French varieties Poitou and Marais and the German variety Schilling's Hochzucht [Schilling's Pedigree] also gave satisfactory yields. The American and Italian varieties tested proved unsuitable for cultivation under Belgian conditions.

3419 Staten, G. & Wilson, M. L.
New Mexico 11-1, a new strain of alfalfa for New Mexico.
Res. Rep. N. Mex. agric. Exp. Sta. 1955 : No. 6 : Pp. 6. (Mimeographed).

The lucerne New Mexico 11–1 is a synthetic composed of six lines, one of which originated from the variety Buffalo, one from the Virginian strain A14 and the remaining four from New Mexico Common. It has outyielded New Mexico Common, being more vigorous and resistant to such diseases as bacterial and *Fusarium* wilts. Fine-stemmed, leafy and darker green than New Mexico Common, it constitutes an improvement in hay quality.

3420 Davis, R. L.
Tetrasomic inheritance of an elongated hypocotyl mutant in alfalfa.
Agron. J. 1956 : **48** : 197–99.

Mutants with an elongated hypocotyl together with a partial deficiency of chlorophyll were first observed in the S_1 of clone 4814 of *Medicago sativa*. They were found to depend upon the nulliplex condition of a single gene, *el*.

3421 Spickschen, G.
Herkünfte und Sorten der französischen Luzerne. (**Provenance types and varieties of French lucerne**).
Saatgutwirtschaft 1956 : **8** : 171–72.

Since *Medicago sativa* was first introduced into France in the sixteenth century it has hybridized freely with the indigenous *M. falcata*; natural selection, operating on these hybrid populations, has given rise to a wide range of provenance types and land races, the most important of which are the Flamande and Ormelong types in Northern France, the Poitou and Marais types in Western France and the Provence type in the south. The author describes each in turn and points out morphological and physiological differences between them. Under German conditions the Flamande type, from which the varieties Flandria, Socheville, W268, FD100, Chartainvilliers and Orchesienne are derived, and the Ormelong type, which has given rise to Du Puits and Emeraude, are to be preferred as they mature earlier, give higher yields and are more resistant to frost; their main drawback is the higher percentage of coarse stems. It is suggested that Germany should in future import lucerne seed from northern France rather than, as hitherto, from south-eastern Europe.

3422 Pedersen, M. W., Petersen, H. L., Bohart, G. E. & Levin, M. D.
A comparison of the effect of complete and partial cross-pollination of alfalfa on pod sets, seeds per pod, and pod and seed weight.
Agron. J. 1956 : **48** : 177–80.

All the flowers on one member of each of six pairs of lucerne clones and one third of the flowers of the other member were artificially cross pollinated. Where all the flowers were cross pollinated, 46·7% of them formed pods with an average weight of 11·3 mg.; when one third were cross pollinated, 66·4% formed pods with an average weight of 12·7 mg., the higher weight being accounted for by heavier seeds and pod tissue. There were some interclonal differences in pod set but clones were similar in reaction to different rates of pollination.

3423 Shinners, L. H.
Authorship and nomenclature of bur clovers (Medicago) found wild in the United States.
Rhodora 1956 : **58** : 1–13.

A taxonomic revision of North American species and varieties of *M. arabica*, *M. laciniata*, *M. minima*, *M. orbicularis* *M. polymorpha* and *M. praecox* is presented.

3424 Cabezas de Herrera, E.
Infección de la alfalfa con distintas estirpes de *Rhizobium.* (**Infection of lucerne with different strains of *Rhizobium***).
An. Edafol. Fisiol. veg. 1956 : **15** : 85–110.

Plants of lucerne were grown in a nitrogen-free medium after inoculating the seeds with cultures of *Rhizobium* from different leguminous species. The only one which produced infections immediately was that from *Lens esculenta.* When the strains had been cultured for three months in an artificial medium however they all acquired the capacity to infect lucerne.

3425 Pandey, K. K.
Mutations of self-incompatibility alleles in *Trifolium pratense* and *T. repens.*
Genetics 1956 : **41** : 327–43.

In investigations at the John Innes Horticultural Institution, England, *S* alleles for incompatibility in *T. pratense* and *T. repens* mutated spontaneously and as the result of X irradiation. Some mutations were reversible; others affected only the pollen-controlling component of the *S* gene or only the part governing stylar reaction, while a fourth type involved both components. Reversible and permanent mutations induced by X rays occurred in approximately equal proportions in *T. pratense*; in *T. repens* 94·25% of the induced mutations were permanent. About 60% of the mutations resulting from X irradiation were of the double type in *T. repens* but this type was not found in *T. pratense.* In both species the two parts of a given allele responded consistently to X rays; in *T. pratense* S_1 and S_2 always underwent permanent mutation of the style-controlling part and S_4 mutation of the pollen-governing component; in *T. repens* S_6 and S_7 mutated permanently only in the parts determining pollen reaction. With the exception of three cases in *T. pratense*, which were probably due to contamination, all the mutations resulted in self-fertility.

3426 Gilkey, H. M.
A new *Trifolium* from Oregon.
Madroño, S. Francisco, 1956 : **13** : 167–69.

A newly-discovered large-headed clover species, *T. owyheense*, from Oregon, is described.

3427 Orthmann,
Deutsche Rotklee-Hochzuchten sind dem Importsaatgut überlegen. (**German pedigree strains of red clover are superior to imported seed**).
Mitt. dtsch. LandwGes. 1956 : **71** : 336–37.

In trials conducted in the Rhineland in 1950–54 German pedigree varieties such as Lembkes Rotklee [Lembke's red clover] and Steinacher Hochzucht [Steinach Pedigree] proved superior in yield, reliability and winter hardiness when compared with a number of varieties from northern France, England and Bohemia.

3428 Povilaitis, B. & Boyes, J. W.
A cytological study of autotetraploid red clover.
Amer. J. Bot. 1956 : **43** : 169–74.

In a study of ten C_2 autotetraploids ($2n = 28$) of the red clover Dollard, the mean numbers for associations at metaphase I were found to be $0{\cdot}49_{\mathrm{I}}$, $6{\cdot}63_{\mathrm{II}}$, $0{\cdot}30_{\mathrm{III}}$ and $3{\cdot}31_{\mathrm{IV}}$. Higher associations occurred with extremely low frequencies. The percentages of pollen mother cells with univalents at metaphase I, abnormalities in division I and abnormalities in division II were 31·2, 33·4 and 30·6, respectively. The percentage of quartets with one or more small extra cells was 33·6. With one exception the correlation coefficients between these four percentages were significant. Meiotic irregularities were only partly responsible for the pollen abortion observed.

3429 Povilaitis, B. & Boyes, J. W.
A study of fertility in diploid Dollard red clover.
Canad. J. agric. Sci. 1956 : **36** : 59–71.

Crosses were made within and between the open-pollinated progenies of one high seed-yielding and one low seed-yielding diploid plant selected from two distinct lines of Dollard. A type of partial male sterility appeared to be genetically determined, the correlation coefficient between mean percentages of pollen abortion in the progenies of 12 crosses and the parental mean values being positive and significant ($r = 0{\cdot}894$). Meiotic abnormalities accounted for only a small proportion of aborted pollen in many plants and did not seem to affect seed set. The mean number of seeds per head was generally higher and less variable in progenies from out crosses than in those from sib crosses. In both sib and out crosses, progenies from two high-yielding parents gave higher seed yields than those from one high and one low-yielding parent.

3430 Pandey, K. K.
Incompatibility in autotetraploid *Trifolium pratense.*
Genetics 1956 : **41** : 353–66.

Investigations were carried out on colchicine-induced autotetraploids of *T. pratense* at the John Innes Horticultural Institution, England. The S alleles in the diploid pollen genotypes $S_{1\cdot 3}$, $S_{2\cdot 3}$ and $S_{2\cdot 4}$ interacted competitively, long pollen tubes being produced in styles with the same alleles. Some selfed seed was produced by $S_{1\cdot 1\cdot 3\cdot 3}$ and $S_{2\cdot 2\cdot 3\cdot 3}$ plants. The pollen genotypes $S_{1\cdot 2}$, $S_{1\cdot 4}$ and $S_{3\cdot 4}$ produced only small tubes and therefore did not show competition. Some S alleles had a dominant action in the diploid pollen, S_4 being dominant over S_1, S_2 and S_3, S_2 over S_1 and S_3, and S_1 over S_3. When selfed, different individuals of the same S genotype varied in pollen-tube growth, seed set, and the effect of temperature upon pollen-tube growth. It is suggested that the weakening of incompatibility by allelic competition allows modifier genes, which have no obvious effect in the diploid form, to exert their influence in the autotetraploids. It has been generally observed in self-incompatible diploids in *Trifolium* and other genera that cross-incompatible types produce more seed when crossed than when selfed; probably inbreeding depression is responsible for the lower set from selfing. In the autotetraploids, however, selfing gives more seed set than incompatible crossing; this is attributed to the effect of minor genes for self compatibility.

3431 Semenov, A. L.
(The varieties of red clover in White Russia and their seed production).
Zemledelie (Agriculture) 1956 : No. **3** : 62–66. [Russian].

Productive and hardy clovers Polockiĭ Rannespelyĭ [Polock Early], Sluckiĭ Rannespelyĭ [Sluck Early] and Minskiĭ Pozdnespelyĭ [Minsk Late] were selected from local White Russian populations. The early forms show resistance to anthracnose.

3432 Bingefors, S.
Inheritance of resistance to stem nematodes in red clover.
Nematologica, Leiden 1956 : **1** : 102–08.

In inheritance studies carried out at the Ultuna branch of the Swedish Seed Association, intensive selection for two generations in the susceptible local red-clover strain Ultuna resulted in a marked improvement in resistance. Of 15 crosses between susceptible Ultuna x Merkur and susceptible Merkur plants, ten gave few or no resistant plants, four gave 10–20% resistant plants and one gave 40%. The average proportion of resistant individuals in the progenies of 39 crosses between resistant lines of Ultuna x Merkur and of Merkur was 82%; estimates of heterogeneity indicate, however, that more than one type of segregation is involved. Various types of segregation also occurred in crosses between a susceptible Ultuna plant and resistant Merkur and Ultuna x Merkur lines.

3433 Diachun, S. & Henson, L.
Sympton reaction of individual red clover plants to yellow bean mosaic virus.
Phytopathology 1956 : **46** : 150–52.

Marked interclonal differences in reaction to a single isolate of yellow bean mosaic virus were observed in the red clover Kenland, 8 out of the 126 clones tested being free from symptoms; symptoms on other clones varied between mild mottling and lethal necrosis.

3434 Morley, F. H. W., Brock, R. D. & Davern, C. I.
Subspeciation in *Trifolium subterraneum.*
Aust. J. biol. Sci. 1956 : **9** : 1–17.

In studies of a limited number of combinations between 12 Australian varieties, a few of the hybrid progenies were fertile but most showed pollen sterility, reduced seed set and embryo abortion in the F_1 and F_2 generations. Dwarf and semidwarf plants segregated in some F_2 populations. The occurrence and severity of these abnormalities were correlated between different F_2 progenies, but within each F_2 the abnormalities appeared to segregate independently. Less than 40% of the pollen sterility could be accounted for by the chromosomal rearrangements indicated by failure of pairing, reduced chiasma frequency and the formation of multivalents at meiosis; control of sterility seemed to be largely genic. In view of the marked sterility barriers, it is thought that the varieties were probably reproductively isolated before the introduction of the species into Australia.

3435 Böcher, T. W., Larsen, K. & Rahn, K.
Experimental and cytological studies on plant species. II. *Trifolium arvense* and some other pauciennial herbs.
K. danske vidensk. Selsk. 1955 : **8** : No. **3** : Pp. 31.

Details are given of the flowering times, length of heads, plant size, habit, dry weight and photoperiodic response of collections of *T. arvense* obtained from numerous localities in Europe and grown in pot and field experiments at the University of Copenhagen during 1950–54. All the collections, with the exception of one tetraploid strain from Poland, were diploid. South European material sown in spring flowered very early, as did also the tetraploid, but northern strains, which flowered normally when sown in autumn, failed to flower when spring-sown unless subjected to short-day treatment after germination.

Variation within the species appeared to be of the continuous clinal type, no clear evidence of the formation of distinct morphological races being found.

Similar but less extensive investigations were carried out on other species, including *Calamintha acinos*, in which both perennial and pauciennial races are found, the term pauciennial referring to plants with a life-span of 1–3 years and no means of vegetative reproduction.

3436 Kurth, H.
The vernalization of some leguminous plants, especially of hairy vetches.
Euphytica, Wageningen 1956 : **5** : 63–70.

Vernalization induced earlier flowering in *Vicia villosa*, *V. pannonica* and *V. sativa*; interspecific and intervarietal differences in response to treatment were slight. In *V. villosa*, vernalized plants showed more rapid early growth than untreated material, flowered sooner and yielded more seed with a higher 1000-kernel weight but did not attain the seed yield or 1000-seed weight of autumn-sown plants. In *V. sativa* vernalization is effective only under short-day conditions; *V. faba* and *Lupinus albus* similarly show better response under short than under long days.

3437 Ilchievici, C. & Vargă, P.
Sparceta. (**Sainfoin**).
Îndrum. Teh. Inst. Cerc. agron. 1955 : No. 59 : Pp. 111.

In Chap. VIII of this booklet, sainfoin breeding in the USSR is reviewed and an account is given of trials of local and introduced strains in Rumania. The high-yielding hybrid ICAR 6 was obtained by open pollination of a mixed stand of *Onobrychis sativa*, *O. cyri*, *O. antasiatica*, *O. arenaria*, *O. lanceolata* and *O. gracilis*.

3438 Johnson, I. J.
Further progress in recurrent selection for general combining ability in sweetclover.
Agron. J. 1956 : **48** : 242–43.

Repeating the procedure adopted in the first and second cycles of recurrent selection of Madrid (cf. *PBA*, XXIII, Abst. 1275), S_1 lines from ten S_0 plants selected from the Syn. 2 generation of the second cycle are now being intercrossed to produce the third cycle. S_0 plants in each cycle are chosen on the basis of the green weight produced by their open-pollinated progenies in the first year of growth. In this open-pollinated progeny test, the first and second cycles showed a superiority of approximately 30% and 60% respectively in mean yield over the open-pollinated progenies of the original population. Two reasons are suggested to account for these high gains: (1) the gene frequency for high combining ability may have been low in the original population, the opportunity for considerable improvement thus being offered, and (2) use of Syn. 2 testers instead of a uniform standard tester contributed to the high degree of combining ability. The yields of the open-pollinated progenies of the 55 second-cycle plants tested ranged from 110% to 200% of the yield of the variety from which the initial population was obtained; further substantial progress in the third cycle is therefore expected.

3439 Sandal, P. C.
Improvement of sweetclovers for North Dakota's farmers.
Bi-m. Bull. N. Dak. agric. Exp. Sta. 1956 : **18** : 102–07.

The results of variety trials carried out during

1952–55 are summarized. In the eastern part of the state, the yellow-flowered selections A–46 and S–65 from Wisconsin and the white-flowered variety Evergreen gave the best results. In the western area, yellow-flowered varieties, notably Madrid and Yellow Common, are better adapted than white-flowered types. Breeding is briefly described, with reference to resistance to diseases such as black stem and leaf mosaic, and an attempt to develop yellow-flowered lines low in coumarin content by crossing yellow selections with low-coumarin white selections with the aid of embryo culture.

3440 HODGSON, H. J. & BULA, R. J.
Hardening behaviour of sweetclover (*Melilotus* spp.) varieties in a sub-arctic environment.
Agron. J. 1956 : **48** : 157–60.

Of 11 varieties tested at Palmer, Alaska, for winter survival, carbohydrate reserves, electrical conductivity of water extracts, which is inversely related to cold resistance, and nitrogen content of the root, only Arctic, Brandon Dwarf, Erector and Alpha showed appreciable winter survival, and of these, Arctic, Brandon Dwarf and Erector had the highest nitrogen content and the lowest conductivities. Nitrogen content was closely associated with cold resistance, water-soluble protein nitrogen showing the highest correlation. High carbohydrate reserves were generally associated with winter survival but the relationship was not consistent.

3441 PARIŠKURA, I.
(**A new variety of forage lupin**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. **4** : p. 42. [Russian].

Nosovskiĭ Belosemjannyĭ [White-seeded Nosovka], selected from local Ukrainian material at the Nosovka Breeding Station, is an indehiscent and lodging-resistant variety productive of high quality forage and seed.

3442 LECHNER, L.
Sorten- und Herkunftsfragen bei Bitterlupinen. (**Questions of variety and provenance in bitter lupins**).
Mitt. dtsch. LandwGes. 1956 : **71** : 461–63.

Since work on breeding sweet lupins was initiated in Germany the cultivation of bitter lupins has been discouraged and no new varieties have appeared on the home market. As a result some 95% of the seed sown has to be imported. The author questions whether the present policy is entirely justified as in certain of the more infertile regions of western Germany the value of bitter lupins as a source of green manure and nitrogen, especially when grown between rows in potato fields, is probably far greater than the fodder value of sweet lupins, which are inferior to native strains of the bitter lupin in yield of seed and green matter and in resistance to diseases and insects. Tests of seed of *Lupinus albus*, *L. angustifolius* and *L. luteus* from different countries were carried out at Weihenstephan, Bavaria; the samples examined represented, in most cases, mixtures of different genotypes and were not uniform as regards maturity group. In the case of *L. albus*, seed from Portugal gave better results than seed from Italy or Yugoslavia; seed of *L. angustifolius* from the USA and South Africa proved superior to seed from Denmark or New Zealand.

3443 KREITLOW, K. W. & YU, H. S.
Host range, temperature relationships, and pathogenicity of *Cercospora loti*.
Phytopathology 1956 : **46** : 269–72.

Of 12 species of *Lotus* and related genera, *L. peregrinus* was immune, *L. tenuis* highly resistant and *L. corniculatus* intermediate in reaction to cultures of *C. loti* from Maryland and Georgia; all varieties and selections of *L. uliginosus* were highly susceptible. Differences in virulence were found among single-spore isolates.

3444 MALIK, H. C. & BATRA, P. C.
If it is drought-resistance, 'guara' has it.
Indian Fmg. 1956 : **5** : No. 12 : 28–29.

Five varieties of *Cyamopsis psoralioides*, a forage crop especially suitable for nonirrigated areas in the Punjab, have been developed at the Fodder Research Station, Sirsa. Of these, No. 2 is considered to be the best under both normal and adverse conditions. It is hairy, highly resistant to drought and much branched, producing high yields of forage and seed.

3445 PANELLA, A.
Indagini preliminari sul miglioramento genetico della sulla. (**Preliminary researches on the genetic improvement of *Hedysarum coronarium***).
Sementi elette 1956 : **2** : No. 4 : 26–33.

In confirmation of results previously reported by Crescini the author has observed only 0·3% of set in bagged flowers left to self pollinate; when the flowers were shaken to improve pollination a set of 5% was obtained; open pollination gave 50% set. Attempts at artificial pollination of emasculated flowers have not been successful and further studies on the technique are being undertaken.

Polycross progenies distinguished by rapid spring growth and early commencement of dormancy in the autumn have been obtained.

Some 200 plants immune from mildew have been isolated from populations from central Italy.
The technique of making polycrosses in wire cages with bees or bumble bees is described; the method is being used for making synthetics from the most promising selected plants.

ROOTS AND TUBERS

3446 Marinčik, A. F.
(**A method of vegetative hybridization between beet components of different ages**).
Agrobiologija (Agrobiology) 1956 : No. 2 : 42–51. [Russian].

This report on experiments at Kiev gives technical details of a method used for grafting young plants of chard, beetroot and *Beta corolliflora* on adult roots of sugar beet. Changes observed with regard to physiological, biochemical and morphological characters in the seed progenies of the scion component in the hybrids chard/sugar beet VI 595, chard/sugar beet M6ZZ and beetroot Egipetskaja [Egypt]/sugar beet M6ZZ are described, as are the modes of segregation among the first and second seed generations. The hybrids were characterized by higher root yields and small increases in sugar content. The experiments with *B. corolliflora*/sugar beet I 1305 differed from the above in that the scion was allowed to be open-pollinated by plants of the same variety as the stock. The first seed generation was intermediate with regard to most economic characteristics, but an improvement in the size of roots occurred in the F_2.

3447 Tlach, R.
Runkelrübensorten. (**Forage beet varieties**).
Mitt. dtsch. LandwGes. 1956 : **71** : 332-33.

Tabulated data are presented on the colour and shape of the roots, yield of dry matter of roots and leaves, susceptibility to *Cercospora beticola* and bolting and ease of lifting of the principal varieties of mangel, sugar mangel and fodder sugar beet at present cultivated in Germany.

3448 Coppenet, M. & Calvez, J.
Comparaison des teneurs en matière sèche de betteraves demi-sucrières françaises et de betteraves danoises. (**Comparison of the dry-matter contents of French half-sugar beets and Danish beets**).
Ann. Inst. nat. Rech. agron., Paris : Sér. A : 1955 : **6** : 769–70.

The Danish fodder sugar beet varieties Hunsballe X and Pajbjerg Rex had a higher dry matter content than the French varieties Jaune de Puiseux [Puiseux Yellow] and Vilmorin but their yield of roots per ha. was lower, with the result that the total yield of dry matter was approximately the same for all four varieties. The Danish varieties were less easily harvested than the French varieties.

3449 Stoppelknollen, 1956. (**Turnips, 1956**).
Landbouwvoorlichting 13 : Bijl. 7 : Ber. Rassenkeuze 1956 : No. 204 : Pp. 6.

The main varieties grown in the Netherlands are described briefly and tabulated data are given on the dry-matter content and yield of each variety, the shape of the root and colour of the flesh, degree of resistance to club root and night frosts, ease with which the roots may be harvested and extent to which the leaves remain green.

3450 Shibutani, S. & Okamura, T.
(**On the morphological characters of *Brassica* seeds**).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1955 : **24** : 195–98. [Japanese].

A diagnostic table for the identification of seeds of varieties of *B. campestris*, *B. chinensis*, *B. pekinensis*, *B. narinosa*, *B. japonica*, *B. rapa*, *B. oleracea*, *B. juncea*, *B. napiformis* and *B. napus* is presented. The characters utilized are the colour, shape, weight, surface reticulation of the seed and cross section of the testa. Seed weight and bolting period are inversely related.

3451 Schick, R. & Gall, H.
Zur Sortenwahl bei Kartoffeln. (**On the choice of potato varieties**).
Dtsch. Landw., Berl. 1956 : **7** : 114–26.

Detailed information on the morphological characteristics, disease resistance, eating quality and starch and tuber yields of varieties recommended for cultivation in Eastern Germany is presented. Advice is also given on the best varieties for different types of soil and geographical localities.

3452 Kartoffelsorten zur Auswahl. (**Potato varieties that may be chosen**).
Mitt. dtsch. LandwGes. 1956 : **71** : 204–07.

Tabulated data are presented on the yield, soil requirements, shape and colour of tuber, starch content and disease resistance of varieties approved for cultivation in Western Germany.

3453 Catalogue des espèces et variétés de pommes de terre. (**Catalogue of potato species and varieties**).
Pomme d. Terre franç. 1956 : **19** : No. 200 : 2–3.

Tabulated data are presented on the tuber and plant characteristics, disease resistance, cooking quality, soil requirements, maturity group, yield and starch content of 40 varieties recommended for cultivation in France. The origin of each variety and the name of the breeder are also given.

3454 PUŠKAREV, I.
(**Improve potato breeding and nursery practices**).
Zemledelie (Agriculture) 1956 : No. 2 : 101–07. [Russian].

The 1936 instructions of the Potato Institute are criticized on the following grounds. Too much emphasis is laid on vegetative hybridization at the expense of sexual hybridization, which should be the principal method for breeding new varieties; vegetative hybridization should only be used to overcome incompatibility in interspecific crosses. Training new varieties and hybrids for high yield by growing them upon rich soil is a fallacy, as such material becomes unproductive when transferred to another type of soil. Experiments at the White Russian Potato Research Station, as exemplified by the development of Sejanec 6–448 [Seedling 6–448], which is distinguished by a high starch content, also suggest that training upon rich soil is deceptive when breeding for high starch. Lastly it is stated that many valuable hybrids are lost as a result of rigorous selection for high yield in the F_1. Rules on the production of the élites issued by the USSR Ministry of Agriculture are also criticized, mainly on the ground that they are based on research limited to certain climatic and soil conditions only.

3455 FELECAN, V.
Culturi comparative cu linii noi și soiuri de cartof la Stațiunea Experimentală de Ameliorarea Plantelor din Cluj. (**Comparative trials of new lines and varieties of potato at the Experimental Station for Plant Breeding at Cluj**).
Anal. Inst. Cerc. agron. Român. 1954 : **21** : No. 2 : 65–83.

Promising new lines were obtained from selfing Galben timpuriu (=Yellow Earliest-of-all), Deodara, Merkur, Orsey, Sieglinde, Weisses Rössl and from the crosses Mittelfrühe [Mid-early] x Deodara and Mittelfrühe x Merkur. Comparative trials of the new lines and standard varieties are reported. Data are provided on yield, vegetative period, resistance to viruses and starch and protein contents.

3456 SMITH, K. M.
Redcliffe Nathan Salaman 1874–1955.
Biogr. Mem. Fellows Roy. Soc. 1955 : **1** : 239–43.

This obituary notice includes an account of Salaman's research on potato viruses and genetics.

3457 HARBORNE, J. B.
Biochemical genetics of the acylated anthocyanins of tuberous Solanums.
Biochem. J. 1956 : **63** : p. 30P. (Abst.)

As reported by Dodds and Long (cf. *PBA*, XXV, Abst. 2150), the acylated glycosides of pelargonidin, peonidin and petunidin are the main pigments present in cultivated diploid *Solanum* spp. The presence of a gene for acylation was later detected by the same authors (unpublished work). Pigment analysis of tubers by the present writer has indicated that besides controlling acylation of anthocyanins with p-coumaric acid, this gene has other effects. When the gene is recessive the glycoside component becomes a 3-pentose glycoside instead of a 3 : 5-diglycoside. The recessive gene also suppresses peonidin production, cyanidin or delphinidin being formed instead, according to the genotype.

3458 THIJN, G. A.
Methods used in evaluating potato seedlings.
Euphytica, Wageningen 1956 : **5** : 55–62.

Details are given of the maintenance and assessment of potatoes as practised at Prof. Broekema Farm, Marknesse, Netherlands, in the five years following the raising of the seedlings in the greenhouse (cf. *PBA*, XXV, Abst. 368), the layout of trial plots and the selection procedure being described for each year.

3459 THIJN, G. A.
De nakomelingschap van Record. (**The offspring of Record**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1956 : **12** : 100–01.

The origin of the above potato is given, together with notes on its numerous offspring in the Netherlands, Belgium, France and Germany. The quality and economic value of some of the more important varieties included in the pedigree table are discussed briefly.

3460 MADEC, P. & PERENNEC, P.
Les possibilités d'évolution des germes de la pomme de terre et leurs conséquences. (**The possibilities of development of potato sprouts and their consequences**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1955 : **5** : 555–74.

Varietal differences in the length of the rest period are noted. Lack of light, high temperatures or a high degree of humidity shorten the period of dormancy.

3461 STEINECK, O.
Die Jugendentwicklung einjähriger Kartoffelsämlinge unter verschiedenen Tageslängen bei Topfkultur. (**The juvenile development of one-year old potato seedlings grown in pots under different day lengths**).
Bodenkultur 1956 : **8** : 374–81.

Stolon and tuber formation in young seedlings derived from selfed plants of the variety Flava and from the cross Saskia x Flava were studied under 16 hr. and 12 hr. photoperiods. Both lines produced more stolons and tubers in the shorter of the two day lengths but Flava appeared better adapted to the 12 hr. photoperiod than did the Saskia x Flava plants. Marked differences between individual plants in photoperiodic requirements were observed, especially among the hybrids. It is suggested that short-day plants may be eliminated in breeding programmes by growing seedlings in pots under a 16 hr. photoperiod, when plants with short-day requirements can be readily detected.

3462 POOS, J. A. J.
Ervaringen met aardappelen in het najaar van 1946–1956. (**Experiences with autumn potatoes, 1946–56**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1956 : **12** : 104–07.

Hybrids obtained at the Veghel Breeding Station, Netherlands, from crosses between *Solanum tuberosum* and *S. demissum* gave, upon repeated back crossing to the *S. tuberosum* parent, highly productive clones with short-day requirements and a high degree of resistance to *Phytophthora infestans*. These new varieties may be planted at the end of July or beginning of August, after the main cereal crop has been reaped, and harvested at the end of October. It is thought likely that crosses carried out at other stations between *S. tuberosum* and *S. andigenum*, to transfer resistance to eelworm to cultivated varieties may also have given rise to some short-day clones that may be planted in July or August.

3463 WILLIAMS, E. J.
Seed failure in the Chippewa variety of *Solanum tuberosum*.
Bot. Gaz. 1955 : **117** : 10–15.

Under field conditions at the Door County Station, Wis., Chippewa fails to set seed after selfing whereas its sibling Katahdin usually sets seed readily. The two varieties were therefore investigated with respect to seed development after selfing. The megagametophyte of Chippewa was capable of deterioration at any stage of its development; concurrently endothelial enlargement and proliferation occurred. Except for a multicellular endosperm in some ovules, no evidence of seed development was detected. Breakdown of the ♀ gametophyte apparently depends on environmental conditions.

3464 BAMBERG, K. K.
(**Sorting seed potatoes by chemical means**).
Latv. PSR Zināt. Akad. Vestis 1954 : **89** : No. 12 : 44–54. [Russian].

At Priekuli, starch contents for some potato varieties and different tuber samples of a variety have been determined by specific gravity and the results form the basis of an analysis of the relations between starch content, on the one hand, and yield, incidence of infection with virus A and *Phytophthora*, tuber size and contents of nitrogen, phosphorus and potash on the other. Sowing tuber samples high in starch improved the yield and increased the percentage of healthy tubers.

3465 FRIMMEL, G.
Über Hormone in Kartoffelpollen. (**On hormones in potato pollen**).
Bodenkultur 1956 : **8** : 349–51.

Experiments at the Anzberg Potato Breeding Station, Austria, suggested that the low seed-set observed in certain intervarietal crosses was due to a deficiency of certain hormones in the pollen of the ♂ parent. Treatment of the stigmas of the ♀ parent with hormone extracts prepared from the pollen of *Lathyrus* sp. or with an aqueous solution obtained by crushing 10 anthers of the potato variety Rotkehlchen [Robin] in 1 cc. of water was found to be efficacious in remedying this deficiency.

3466 Schark, A. E., Peterson, C. E. & Carlin, F.
The influence of variety on the specific gravity-mealiness relationship of potatoes.
Amer. Potato J. 1956 : **33** : 79–83.

A detailed report is given of investigations already referred to in Abst. 2511.

3467 Ochoa, C.
Nuevo germoplasma para la genética de inmunidad en papas. (**New germplasm for the genetics of immunity in potatoes.**)
Biota, Magdalena del Mar 1954 : **1** : 1–10.

Descriptions are given of the recently discovered species *Solanum chiquidenum* (cf. *PBA*, XXV, Abst. 2139) and *S. ambosinum*. *S. chiquidenum* should probably be assigned to a new series; *S. ambosinum* pertains to series *Tuberosa*. *S. chiquidenum* and *S. piurae* are immune to races 0, 1, 4, 1·4 and 2·4 of *Phytophthora infestans* (cf. *loc. cit.*).

3468 Keller, E. R.
Bericht über die Hauptversuche mit neuen Kartoffelsorten 1953–55. (**Report on the principal trials of new potato varieties, 1953–55**).
Mitt. schweiz. Landw. 1956 : **4** : 65–75.

Data are presented on the tuber yields, starch contents, starch yields, disease resistance and cooking quality of the German varieties Augusta (cf. *PBA*, XXV, Abst. 2129), Benedikta (cf. *PBA*, XXV, Abst. 2129), Capella and Maritta (cf. *PBA*, XXIV, Abst. 433), recently introduced into Switzerland. Capella is described as a white-skinned variety with yellow flesh moderately resistant to *Phytophthora infestans* but somewhat susceptible to *Streptomyces scabies* and virus diseases. Its main disadvantage is that it matures extremely late.

3469 Ochoa, C.
Expedición colectora de papas al norte del Perú. (**Potato collecting expedition in northern Peru**).
Biota, Magdalena del Mar 1955 : **1** : 47–64.

A potato collecting expedition in northern Peru, led by the author and asisted by the Rockefeller Foundation, was conducted in 1952. A description is given of the route taken and of the material collected. The wild *Solanum* species are still being worked upon, but new species appear to have been found and extensions to the known ranges of other species are reported; 385 cultivated varieties were collected. Several of the cultivated varieties have high starch contents or are notably early. *S. piurae* and *S. chiquidenum* are resistant to late blight; *S. sogarandinum* and *S. jalcae* are resistant to frost.

3470 Ančev, T.
(**A study of the potato varieties in the People's Republic of Macedonia**).
God. Zborn. zemjod.-šumarsk. Fak. Univ. Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje)/Ann. Fac. Agric. Sylvicult. Univ. Skopje : Zemjod. : 1950/51 (1953) : **4** : 163–78. [Macedonian].

An account of commonly grown varieties, mostly introductions, some dating many years back, mentions Valjuga, originating from Bulgaria, which shows resistance to diseases and physiological deterioration.

3471 Katin-Jarcev, L.
(**Early potato varieties for Siberia**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 4 : p. 19. [Russian].

The previous report on Severjanin [Northern] and Sedov (cf. Abst. 1415) is amplified by recent data on their tuber yields in different districts. Both varieties showed resistance to drought.

3472 Cunningham, C. E., Akeley, R. V. & Nielsen, K. F.
Cooperative potato variety trials in Maine.
Amer. Potato J. 1956 : **33** : 69–78.

Numbered seedlings, bred at the Plant Industry Station, Beltsville, Md., and named varieties were grown at Aroostook Farm, Presque Isle, Maine, and evaluated with respect to yield, quality, time of maturity, disease resistance, tuber size and reaction to storage. Of the unnamed varieties B595–76 showed promise on account of its high quality and resistance to late blight, common scab, *Verticillium* wilt and viruses A and X, although only a moderately good yielder. B355–35 was high yielding, with a high content of solids and resistance to ring rot, late blight and virus A. Plymouth (B73–10) produced good yields of medium-quality tubers resistant to scab (cf. Abst. 2517). The early seedling B911–21, resistant to ring rot, outyielded Katahdin but was somewhat poorer in quality.

3473 Stevenson, F. J.
Breeding varieties of potato resistant to diseases and insect injuries.
Amer. Potato J. 1956 : **33** : 37–46.

A short historical survey is given of potato breeding in the USA, with particular reference to resistance to virus, bacterial and fungous diseases and to leafhopper and aphid injury. The economic results of this work are indicated.

3474 BONDE, R., STEVENSON, F. J., AKELEY, R. & MERRIAM, D.
New potato varieties may eliminate ring rot, late blight and other diseases.
Maine Fm. Res. 1956 : **3** : No. 4 : 23–25.

At the Maine Agricultural Experiment Station, promising ring-rot resistant seedlings have been bred which are also resistant to late blight, common scab and viruses A and X.

3475 GREGORY, K. F. & VAISEY, E. B.
Pathogenicity of tyrosinase-deficient mutants of *Streptomyces scabies*.
Canad. J. Microbiol. 1956 : **2** : 65–71.

Spontaneous and X-ray-induced mutants were simultaneously tyrosinase-deficient and unable to form a brown ring in skimmed milk; cultures giving a positive reaction in the brown-ring test produced tyrosinase. It is therefore concluded that the brown-ring reaction was a manifestation of a tyrosinase reaction. The tyrosinase-deficient mutants were all pathogenic to Katahdin

3476 ČEREEVA, S. N.
(**Utilizing vegetative hybridization in breeding potatoes for hardiness**).
Agrobiologija (Agrobiology) 1956 : No. 1 : 83–85. [Russian].

This report on vegetative hybridization at Igarka, Siberia, mentions the use of *Solanum schreiteri*, *S. punae* and *S. demissum* as scions in grafts designed to improve the hardiness of domestic varieties and seedlings. Vegetative hybrids of economic value developed in recent years include A 25 (Sejanec 2–7 [Seedling 2–7]/Igarka), A 31 (Sejanec 2–7/M. Hrennikova [M. Hrennikov's]) and A67 (Sejanec 2–7/[*Phytophthora*-resistant Sejanec 8670 x Sejanec 9/118]). All these surpass the standard M. Hrennikova in earliness, tuber yield and resistance to black leg, scab and *Oospora*. Sejanec 2–7 was obtained by interspecific sexual hybridization involving *S. schreiteri*.

3477 DESHMUKH, M. J. & HOWARD, H. W.
Field resistance to potato blight (*Phytophtora infestans*).
Nature, Lond. 1956 : **177** : 794–95.

Investigations on the potato varieties Ackersegen and Arran Pilot, respectively field resistant and highly susceptible to late blight, suggested that field resistance is associated with a longer incubation period and production of a smaller number of sporangia. Using the leaflet-disc method of Müller and Haigh (cf. *PBA*, XXIII, Abst. 2795) a small but significant difference was demonstrated between the two varieties in the percentage of discs on which sporangiophores were produced after inoculation by spraying. The discs of Ackersegen showing no sporangiophores were however found to contain hyphae which gave rise to sporangiophores when placed on the cut surfaces of tubers. This method therefore appears to measure probability of producing sporangiophores rather than "probability of becoming infected per unit area of leaf". Examination of the literature suggests that percentage of infection in the disc test may not correspond with field reaction.

3478 ZADINA, J.
Šlechtění bramborů na vzdornost proti plísni. (**Breeding potatoes for resistance to blight**).
Za socialist. Zeměd. 1956 : **6** : 656–59.

Varieties that have previously been reported to show a high degree of resistance (cf. *PBA*, XXV, Abst. 378) proved susceptible to the new virulent biotypes VII and VIII. It is hoped however to obtain resistant forms by interspecific hybridization involving wild potato species.

3479 FRANDSEN, N. O.
Rasse 4 von *Phytophthora infestans* als Feldrasse in Deutschland. (**Race 4 of *Ph. infestans* as a field race in Germany**).
Phytopath. Z. 1956 : **26** : 124–30.

Race 4 was found to have replaced race 0 as the most prevalent physiological race of *Ph. infestans* in north-west Germany in 1955. No changes in the pattern of varietal resistance to the pathogen were discovered among the potato varieties grown in this region.

3480 WEBB, R. E. & BONDE, R.
Physiologic races of late blight fungus from potato dump-heap plants in Maine in 1955.
Amer. Potato J. 1956 : **33** : 53–55.

Eleven races of *Phytophthora infestans* were identified among samples from 15 potato refuse heaps in Aroostook county. Ten of the 15 samples were mixtures of 2 or more races. The common race (0) alone was detected in only one sample. Races pathogenic to Kennebec, which is highly resistant to race 0, were discovered on 11 of the 15 piles.

3481 MALMUS, N.
Unterschiedliche Anfälligkeit der einzelnen Sortengruppen. (**Differential susceptibility of the individual variety groups**).
Kartoffelbau 1956 : **7** : 83–84.

Lerche [Lark], Maritta and Ackersegen proved the most resistant to late blight in trials conducted by the Bavarian State Institute for Plant

Cultivation and Plant Protection in 1954–55. It was shown that spraying resulted in considerable increases in tuber yield and starch content in resistant as well as susceptible varieties.

3482 Romanovič, E. A.
(The effect of interspecific vegetative hybridization upon wart resistance of the potato).
Agrobiologija (Agrobiology) 1956 : No. 2 : 52–57. [Russian].

At Ordžonikidze, North Osetia, scions of *Solanum schickii* and *S. laplaticum* that had been grafted on Rose of Milet stocks transmitted wart resistance to the tuber generations of the domestic variety, without affecting its good economic characteristics. Data on growth, yield, starch and vitamin C contents for the vegetative hybrids are provided.

3483 Kekuh, A. M.
Mărirea rezistenţei plantelor la boli prin metoda hibridării vegetative. **(Increasing the resistance of plants to disease by the method of vegetative hybridization).**
An. Romino-Soviet. Ser. Agric. : 1955 : **24** : 109–14.

This article is a Rumanian version of the Russian paper summarized in *PBA*, XXV, Abst. 1204.

3484 McLean, J. G.
Selecting and breeding potatoes for field resistance to Verticillium wilt in Idaho.
Res. Bull. Idaho agric. Exp. Sta. 1955 : No. 30 : Pp. 19.

About 1200 lines, including more than 100 named varieties, were tested over four years at two localities in Idaho. Late maturing potatoes tended to be free from disease; whether this was due to escaping attack because of lateness or to internal resistance was not always clear. Late varieties of the Menominee type showed some internal resistance. In moderately resistant varieties, such as Mohawk, resistance could sometimes be broken down by changes in environment. The most resistant varieties were 41956, AC25669, AC25673, AC25680, Empire, Harford, Iduna, Menominee, Populair, Potomac, Saranac, Sequoia and Wilpo. Most of these were late or very late in maturity, but 41956 had medium maturity. Resistant material was obtained from crosses between susceptible parents and between susceptible and resistant parents, but the most highly resistant progenies came from resistant x resistant crosses. From certain crosses between early susceptible and late resistant lines, resistant progenies of early or medium maturity have been produced. By crossing susceptible russet types with resistant varieties, russet potatoes with improved resistance have been developed.

3485 Williams, T. D.
The resistance of potatoes to root eelworm.
Nematologica, Leiden 1956 : **1** : 88–93.

In this paper read at the International Nematology Symposium, held at Wageningen, Netherlands, 30 June – 5 July, 1955, and in the subsequent discussion, the author reports on experiments with resistant lines of *Solanum andigenum*, *S. vernei* and *S. stenotomum* x *S. vernei*. Root diffusates from *S. andigenum* resembled susceptible plants in having a marked stimulating effect on the hatching of eelworm cysts, while diffusates from the other resistant lines were less effective. The numbers of larvae found in roots of *S. andigenum* exposed to infection and examined at regular intervals over a period of 100 days were as great as those found in susceptible plants, but very few mature or developing females were seen. A few giant cells were observed in the potato tissue and these were always associated with the few females which reach maturity. *S. vernei* roots under similar conditions contained fewer larvae; these developed more slowly and did not reach maturity.

3486 Huijsman, C. A.
Breeding for resistance to the potato root eelworm in the Netherlands.
Nematologica, Leiden 1956 : **1** : 94–99.

Breeding for resistance to *Heterodera rostochiensis* in the Netherlands since 1946 is surveyed (cf. *PBA*, XXV, Abst. 2181 and XXVI, Abst. 505). Current work is concerned with examining cultivated South American material for resistant lines, with investigating the nature of resistance and with the possibility that new races of the parasite may develop.

3487 Toxopeus, H. J.
Mogelijkheden van gebruik in de plantenveredeling van gekweekte aardappelen uit Zuid-Amerika. **(Possibilities of using cultivated potatoes from South America in plant breeding).**
StudKring. PlantVeredel., Wageningen. Versl. 1955 : **47** : 639–44.

Material collected during an expedition to the Andes in 1955 is described. The main objective was to find material resistant to nematodes. South American cultivated forms were chosen in preference to wild species as they are more easily crossed with European varieties of *Solanum tuberosum* and because it was considered unlikely that wild species contained many genes that could not be found in the exceptionally wide range of cultivated varieties grown in this region. Material resistant to nematodes was found in Bolivia and northern Argentina; varieties from northern Peru, however, did not possess genes for resistance to nematodes. The 976 clones brought back to the Netherlands are now being grown under short-day conditions to stimulate tuber growth and are to be tested, *inter alia*, for resistance to late blight, leaf roll, viruses X, Y and S, Colorado beetle and scab.

3488 GOODEY, J. B.
The susceptibility of potato varieties to infestation by the eelworms *Ditylenchus destructor* and *D. dipsaci*.
Ann. appl. Biol. 1956 : **44** : 16–24.

Twenty-five potato varieties tested in field and pot experiments were susceptible to tuber attack by *D. destructor* isolated from potatoes but suffered little damage from a race obtained from mushroom spawn. Races of *D. dipsaci* were able to damage the shoots.

3489 TOXOPEUS, H. J.
Some remarks on the development of new biotypes in *Heterodera rostochiensis* that might attack resistant potato-clones.
Nematologica, Leiden 1956 : **1** : 100–01.

The life cycle and reproductive behaviour of *H. rostochiensis* are discussed with reference to their role in the possible development and spread of new biotypes. As a precaution against such an occurrence, the desirability of building up and maintaining the widest possible genetic basis for resistance in potatoes is urged.

STREUTGERS, E., BEEMSTER, A. B. R., NOORDAM, D. & VAN DER WANT, J. P. H. (EDITORS).
Proceedings of the second conference on potato virus diseases at Lisse-Wageningen, 25–29 June, 1954.
Wageningen 1955 : Pp. 193.

The following articles of interest to readers of *Plant Breeding Abstracts* are included in this account of the proceedings of the above conference:—

3490 *Thung, T. H., Quanjer, H. M., Smith, K. M. & Bawden, F. C. Redcliffe N. Salaman, M.D., F.R.S., 12 September,* 1874–12 *June,* 1955. (*pp. 11–13*).

Four brief obituary notices on Dr. Salaman, including reference to his work on potato breeding and potato virus diseases, are printed.

3491 *Salaman, R. N. Half a century of potato research.* (*pp. 14–25*).

The author reviews his fifty years of contact with potato breeding and potato virus research and outlines briefly the development of his own interest in this crop plant.

3492 *Cockerham, G. Strains of potato virus X.* (*pp. 89–92*).

A genetical basis for the classification of strains of virus X is outlined. At the Scottish Plant Breeding Station, Edinburgh, it was found possible to distinguish four distinct groups of strains of virus X by the use of a number of potato varieties differentiated by the presence or absence of two genes, each inherited independently, which control hypersensitivity. In addition, strains varying in virulence, thermal inactivation points and serological properties were recognized within each group.

3493 *Larson, R. H., Stahmann, M. A. & Walker, J. C. The induction of mutants in potato virus X by nitrogen mustard.* (*pp. 93–99*).

At the University of Wisconsin, USA, mutants were induced in the necrotic-spot strains of virus X by exposing *Nicotiana rustica* plants employed as hosts to nitrogen mustard vapours in a closed glass chamber. The four types of mutant obtained were transferred to healthy *N. rustica* plants but did not revert to the original form. They differed from the parental strain in the type of chlorotic lesions they caused and in their virulence, three of the four being considerably less virulent than the original strain. Repeated exposures of the original necrotic spot strain of virus X to nitrogen mustard *in vitro* did not result in the induction of mutations, which is taken to indicate that the mutation of a plant virus is similar to the mutation of a gene in being able to take place only in the living cell.

3494 *Munro, J. Strains of potato virus Y in relation to potato varieties.* (*pp. 102–06*).

The results of studies carried out by the Botany and Plant Pathology Division of the Canadian Department of Agriculture, Fredericton, NB, on the interrelationship between some 50 potato varieties and 17 strains of virus Y isolated from 12 commercial strains in Canada and Britain are reported. The symptoms caused by each strain were constant within a given variety and the strains that caused the most severe or least severe symptoms respectively in any one variety usually had the same effect on all varieties, although exceptions to this general rule were observed. All varieties were tolerant of some of the 17 strains but none was tolerant of all the strains. Only 3 of the 17 strains caused infection in all the varieties. It is thought that the common strains of virus Y found in the field at the present time may predominate merely because of the ease with which they can infect the principal varieties at present grown. The introduction of new varieties that are resistant to common strains of the virus may therefore lead to an increase in the relative importance of the less common strains and it is emphasized that this factor must be taken into account in the breeding of new varieties.

3495 *Baerecke, M. L. Untersuchungen zur Blattrollresistenz.* (*Studies on resistance to leaf roll*). (*pp. 111–19*).

Research at the Max Planck Institute for Breeding Research, Voldagsen, Germany, on breeding for resistance to leaf roll is reviewed. Aphids were used to infect 39 wild species of the section *Tuberarium*; although individual plants of *Solanum polyadenium*, *S. chacoense* and *S. pinnatisectum* displayed no external symptoms, all the 39 species examined were susceptible and are not considered suitable material in breeding for leaf-roll resistance. Various clones from the institute's collection and from the USA and the Irish variety Shamrock and the Scottish variety Southesk were then tested. Contrary to expectations, Shamrock and Southesk proved highly susceptible but three Voldagsen clones and the American clone 1276–185USA, from Houma x Calrose, were found to contain a relatively low percentage of infected plants. By means of selfing and diallel crosses, combinations with 8–9% resistant seedlings were obtained. The inheritance of resistance appears to be determined by a system of polygenes.

3496 *Rozendaal, A. & Brust, J. H. The significance of potato virus S in seed potato culture.* (*pp. 120–33*).

The symptoms caused by virus S are described. The combination of virus S with viruses A, X or Y does not give rise to a new complex of symptoms but only to more pronounced manifestations. In 1951–52 yield losses due to infection with virus S amounted to 10–15% in the Netherlands but since this period genealogical selection has improved the situation. Tabulated data on varietal differences in susceptibility to virus S are included.

3497 *Kassanis, B. Carnation latent virus.* (*pp. 134–36*).

Studies at the Rothamsted Experimental Station, Harpenden, England, suggest that a virus serologically related to carnation latent virus is commonly present in apparently healthy potato plants of many species. This virus, which does not cause any visible symptoms, may possibly be related to the paracrinkle virus.

3498 *Oswald, J. W., Rosendaal, A. & van der Want, J. P. H. The alfalfa mosaic virus in the Netherlands, its effect on potato and a comparison with the potato aucuba mosaic virus.* (*pp. 137–47*).

The alfalfa mosaic virus was found occurring naturally in fields of lucerne and white clover in the Netherlands and was shown to be similar in symptomatology and host range to a strain of the virus obtained from California. Varietal differences were observed in the reaction of potato varieties artificially inoculated with the virus but no instances of natural infection were observed in the field. It was shown that the alfalfa mosaic virus and the aucuba mosaic virus are distinct entities.

3499 *Köhler, E. Über weniger bekannte Kartoffelvirosen.* (*On lesser known potato viruses*). (*pp. 148–52*).

The symptoms caused by pseudo-aucuba and Bukett [bouquet], two variants of the tobacco ringspot virus occasionally found on potatoes in Germany, are described.

3500 *Sprau, F. Über das Auftreten einer neuen Viruskrankheit an Kartoffeln.* (*On the occurrence of a new virus disease of potatoes*). (*pp. 153–56*).

A new virus disease of potatoes recently observed in Bavaria and designated dwarf-bush virus is described and its possible relationship with the witches' broom virus of potatoes discussed.

3501 *Gigante, R. Le comportement des variétés de pommes de terre italiennes vers les maladies à virus.* (*The reaction of Italian potato varieties to virus diseases*). (*pp. 187–90*).

Descriptions are given of the symptoms caused by viruses X and Y; since 1934 the incidence of virus disease has become more pronounced in Italy following the introduction of new varieties from abroad. A brief mention is made of the reaction of some Italian varieties to virus diseases.

3502 SALZMANN, R. & KELLER, E. R.
Über Resistenz und Toleranz von Kartoffelsorten gegenüber Viruskrankheiten. (**On the resistance and tolerance of potato varieties to virus diseases**).
Mitt. schweiz. Landw. 1956 : **4** : 75–84.

Tabulated data on the virus resistance or tolerance of a number of potato varieties grown in Switzerland are included in this popular account of breeding and testing for resistance to virus diseases at the Zürich–Oerlikon Research Station.

3503 MOSCOSO, C. G.
El cultivo de la batata en Puerto Rico. (**The cultivation of the sweet potato in Puerto Rico**).
Bol. Estac. exp. agríc. PR. 1955 : No. 126 : Pp. 73.

This general account of the sweet potato in Puerto Rico includes brief remarks on its introduction into cultivation, botanical characteristics and the varieties grown; these include Canela and Rico, which excel the previously popular variety UPR3 in yield and canning quality; descriptions of all three varieties are furnished, with illustrations.

3504 HARMON, S. A. & WOODARD, O. J.
Georgia Red sweetpotato introduction.
Mimeogr. Ser. Ga. agric. Exp. Sta. 1956 : No. N.S. 16 : Pp. 4. (Mimeographed).

Georgia Red has a coppery-red skin, slightly deeper orange flesh than Porto Rico, higher yielding capacity than this type, a growing period of 140 days and outstandingly good storage and table quality. Its parentage consisted chiefly of seedlings of the Porto Rico type. (Cf. Abst. 3506).

3505 SAKAI, M. & MARUMINE, S.
(**Studies on a method of correcting for missing plants in sweet-potato experimental plots**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **24** : 195–96. [Japanese].

The method involves a comparison between the mean yield of the plants on either side of the gap and the mean yield of 10 other plants taken at random in the same row.

3506 HARMON, S. A. & WOODARD, O. J.
A potato from Georgia.
Sth. Seedsman. 1956 : **19** : No. 5 : p. 26.

Released by the Georgia Coastal Plain Experiment Station, the sweet potato Georgia Red has smooth red skin and light orange flesh and is outstanding in storage and baking quality. Its parents are the breeding line T–6 (♀) and an open-pollinated seedling from Cliett Bunch Porto Rico. Plant growth is vigorous but the variety is not resistant to stem rot or internal cork; it equals Porto Rico in tolerance of nematode. (Cf. Abst. 3504).

3507 MENEZES, O. B. DE, ARRUDA, N. B. DE & NUNES, W. DE O.
IV—Melhoramento da batata doce (*Ipomea batatas* (L.) Lam.)—ciclo vegetativo. [**IV. Improvement of the sweet potato (*I. batatas* (L.) Lam.). Vegetative cycle**].
Bol. Inst. Ecol. Exper. Agríc. 1952 : No. 10 : Pp. 41.

Yield and palatability trials of four varieties harvested at monthly intervals are recorded.

3508 HOWELL, M. J. & WITTWER, S. H.
Further studies on the effects of 2,4-D on flowering in the sweet-potato.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 279–83.

Spraying with 2,4–D at concentrations of 100–500 p.p.m. induced flowering in Porto Rico and Yellow Jersey (cf. *PBA*, XXV, Abst. 1214).

3509 MARTIN, W. J.
Varietal reaction to white rust in sweet-potatoes.
Plant Dis. Reptr. 1956 : **40** : 233–34.

Marked differences in reaction to white rust (*Albugo ipomoeae-panduratae*) were observed among varieties and seedlings grown in two localities in south-western Louisiana.

FIBRES

3510 DEŠMUKH [DESHMUKH], P. S.
(**Cotton growing in the republic of India**).
Hlopkovodstvo (Cott.-raising) 1956 : No. **4** : 11–22. [Russian].

Data are provided on length of fibre and weaving properties of the principal Indian varieties of *Gossypium arboreum*, *G. herbaceum* and *G. hirsutum*. Administrative measures designed to maintain varieties in a pure state are referred to briefly.

3511 **Pima S–1 is paying off.**
Agric. Res., Wash. 1956 : **4** : No. 9 : 3–4.

Further information is given on the long-staple cotton Pima S–1, grown in the south-west of the USA (cf. *PBA*, XXIV, Abst. 478). This variety outyields Pima 32 by 20% and makes possible a 16% reduction in picking costs. In the search for an even better cotton to compete with the imported Egyptian variety Karnak, strains of Pima S–1 and crosses of Pima S–1 with other varieties were field-tested in 1955.

3512 Kadyrov, Š.
(Changes in the technological properties of raw cotton induced by insolation).
Hlopkovodstvo (Cott.-raising) 1956 : No. 6 : 43–45. [Russian].

Under Taškent conditions the strength and length of fibre of 108F, 1306DV and 4028 were improved by leaving the bolls on the plants for a few days after they opened. The optimal period was different for each variety. It is shown that insolation beyond the optimal period had a deleterious effect upon the technological properties of all the above varieties and that they produced fibre of superior quality if the bolls were shaded from the day they opened onwards.

3513 Ǵorǵevski, J.
(Some economic characters of Macedonian cotton).
God. Zborn. zemjod.-šumarsk. Fak. Univ. Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje)/Ann. Fac. Agric. Sylvicult. Univ. Skopje : Zemjod. : 1950/51 (1953) : **4** : 179–202. [Macedonian].

Data are provided for the weight of boll, fibre percentage, lint index and length and fineness of fibre for cottons grown in various districts of Macedonia. They are heterogeneous populations of the early Upland type, with admixtures of natural hybrids involving some varieties introduced in recent years. The cottons from the Ǵevǵeli and Strumica districts had the best economic characteristics.

3514 Ragimov, S.
(Azerbaĭdžan, an important cotton base of the USSR).
Hlopkovodstvo (Cott.-raising) 1956 : No. **4** : 6–10. [Russian].

The new cotton varieties 2018/2, 2173, 2421, 2523 and 2306 from the Azerbaĭdžan Cotton Institute outyield the standard 1298 and are superior technologically.

3515 Besedin, P.
(The principal aims in scientific research in cotton production).
Hlopkovodstvo (Cott.-raising) 1956 : No. **3** : 13–18. [Russian].

Mention is made of new varieties S8230 and S1937 from the Cotton Institute. They surpass 108F in earliness by 4–8 days and S1937 has a habit suitable for combine harvesting. Reference is also made to 153F which has been bred at the Fergana breeding station. It is characterized by fuzzless seed.

3516 Méndez R., E. D.
Mejoramiento del algodón Tangüis. Campaña 1954–55. **(Breeding Tangüis cotton. Season 1954–55).**
Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 342 : 11–19. (Mimeographed).

The best lint yields of the season were given by lines LM 633–52 and LM1041–49; the wilt-resistant line LM.W1877–50 also exceeded the standards. Selection work for resistance to nematodes and *Thielaviopsis basicola* is also in progress.

3517 Gerstel, D. U.
Segregation in new allopolyploids of Gossypium. 1. The R_1 locus in certain new world-wide American hexaploids.
Genetics 1956 : **41** : 31–44.

The allele R^{RAI} at locus R_1 is known to determine the production of a large red spot at the base of the petal and of red pigment in the filaments. When colchicine-induced hexaploids ($R_1R_1R^{RAI}R^{RAI}$ or $r_1r_1R^{RAI}R^{RAI}$) of *G. hirsutum* x *G. raimondii* were back-crossed to *G. hirsutum* (r_1r_1), plants with and without the petal spot produced by R^{RAI} segregated in the ratio 8·68 : 1. When colchicine-induced hexaploids of *G. hirsutum* (R_1R_1) x *G. thurberi* were crossed as females with 6*n* *G. hirsutum* x *G. raimondii* lines having the genotype $r_1r_1R^{RAI}R^{RAI}$, the corresponding ratio was 67·1 : 1. Evidence was obtained that these deviations from the 5 : 1 ratio expected from random chromosome segregation were partly attributable to postmeiotic selection. Such selection was however of a much smaller magnitude than the above difference in segregation. Irregular meiotic disjunction was found to be infrequent. The segregation ratios may indicate that the New World cottons are more closely related to *G. raimondii* than to *G. thurberi*.

3518 Joshi, V. K.
Vestigial bract mutant in Gaorani cotton (*Gossypium arboreum* race *indicum* H.S. & S.)
Indian Cott. Gr. Rev. 1956 : **10** : p. 72.

Mutants with vestigial bracts have been discovered in Gaorani 12 in selection plots at the Mahbub Bagh Farm, Parbhani, Hyderabad State. The mutants are much taller than normal and undergo severe shedding of the bolls. Cytogenetical investigations of the mutants and progeny from the two ripe bolls formed are in progress, in view of the importance of vestigial bract as a marker in roguing and a means to cleaner picking.

3519 PODOZERSKIĬ, S. N.
(The breeding of early cotton varieties).
Agrobiologija (Agrobiology) 1956 : No. **1** : 47–51. [Russian].

The Mičurinist basis of breeding work at the Ukrainian Cotton Institute is described. Mention is made of new varieties notable for great earliness, high yield, fine quality and good length of fibre, resistance to diseases and other good economic characters. Some are earlier than the variety **611**, have a boll weight of 4·0–5·5 g. and fibre 30–33 mm. long.

3520 KESAVA IYENGAR, N., SANTHANAM, V. & RAMACHANDRAN, K.
A new occurrence of 'crumpled' lethal gene in *Gossypium arboreum*.
Sci. & Cult. 1956 : **21** : 463–64.

The crumpled condition appeared in the F_1 of dwarf 1016 x Sanguineum. Since the latter parent is known to carry Cp_b, one of the complementary genes for this abnormality, it was concluded that dwarf 1016 contains the other complementary gene, Cp_a. Dwarf 1016 was derived from a cross between two Karunganni cultures, each involving races *indicum* and *cernuum* in their parentage.

3521 NERSESJAN, P.
(The problem of cross pollination in cotton).
Hlopkovodstvo (Cott.-raising) 1956 : No. 3 : p. 49. [Russian].

At Oktemberjan, Armenia, emasculated plants of 1298 were left to open pollinate, in the presence of bees, with other varieties grown in adjacent rows. Fertilization amounted to 96% and the bolls were well-formed and bore normal amounts of seed. It is thought that most cotton flowers are cross pollinated by bees under natural conditions.

3522 STEPHENS, S. G.
The composition of an open pollinated segregating cotton population.
Amer. Nat. 1956 : **90** : 25–39.

By analysing the open-pollinated progeny from a segregating population of Upland cotton whose initial composition in respect of four marker genes was known, separate estimations were made of the relative frequency of the following types of pollination under conditions at Raleigh, NC: (*a*) apparent outpollination, i.e. "foreign" pollination; (*b*) intragenotypic pollination, involving different flowers of the same genotype; and (*c*) self pollination within the same flower. The sum of (*a*) and (*b*) represents the total amount of outpollination. The total amount of hybridization depended not only on the number and activity of the vectors, but also on the effective gene frequency in the population which in turn depended upon the relative frequencies of genotypes in the initial population and the relative amount of pollen produced per flower. The amount of pollen per flower was more important than the number of flowers per genotype in determining type of pollination, differences between genotypes in respect of pollen production per flower accounting for the positive correlation between pollen output and degree of selfing, the constancy of the proportion of intragenotypic pollination, and the negative correlation between the proportion of foreign pollination and selfing. Vector activity was high, estimates of 60–90% being obtained for total outpollination, according to the genotype. It is suggested that vector activity may be an important but overlooked factor in determining the yield of cotton.

3523 **Annual Report of the Director of the Technological Laboratory of the Indian Central Cotton Committee for the year ending 31st May, 1955 :**
Pp. 44.

In addition to a survey of technological research, the report summarizes the results of spinning and fibre tests on (1) standard Indian cottons (cf. Abst. 1473), (2) trade varieties (cf. Abst. 1474) and (3) improved strains and experimental material developed by the state agricultural departments.

3524 IYENGAR, R. L. N. & SEN, D. L.
Development of a suitable technique for the determination of halo length of cotton.
Indian Cott. Gr. Rev. 1956 : **10** : 1–28.

An extensive account is given of investigations undertaken to devise a standard technique of measuring halo length, for use at all the state cotton breeding stations in India. Of the methods tested, a modification of the technique used at Coimbatore was finally considered to be the most acceptable as the standard.

3525 RODRÍGUEZ, J. P., CARO, R. G. & ROMERO, R. V.
Cotton variety trials in Puerto Rico.
J. Agric. Univ. PR 1956 : **40** : 49–61.

In trials carried out at various localities, Sealand generally gave the highest yields but was equalled in some parts of the island by Montserrat

Sea Island, which proved to be of better fibre quality.

3526 **Fiber- and spinning test results for some varieties of cotton grown by selected cotton improvement groups. Crop of 1955.**
Agric. Inform. Bull. US Dep. Agric. 1956 : No. 152 : Pp. 51. (Mimeographed).

The results of tests of the fibre and manufacturing properties of the principal commercial varieties comprising the 1955 crop in the USA are summarized along the lines of previous reports (cf. *PBA*, XXV, Abst. 3241).

3527 Vélez Fortuño, J.
Inheritance of staple length in upland cotton (*Gossypium hirsutum* L.) and its inter-relationships with perimeter, wall thickness, and weight fineness of fiber.
J. Agric. Univ. PR 1956 : **40** : 1–48.

The mean staple lengths of the F_1 and F_2 generations of a cross between Florida 1377 and DPL 45–867, two varieties representing the extremes of the range in staple length in Upland cottons, were greater than the mean of the parents, indicating partial dominance of long staple over short. The minimum number of genes involved, as estimated by the Castle-Wright formula, was 9·38. The heritability of staple length was 85% in the F_2. The following highly significant correlation coefficients were obtained: between fibre length and perimeter, — 0·319; between fibre length and wall thickness, —0·434; and between length and weight fineness of the fibre (micrograms per inch), —0·568. There was a highly significant multiple correlation of 0·59 between length and the two dependent variables, perimeter and wall thickness. Regression coefficients of perimeter, wall thickness and weight fineness on length of fibre were also highly significant.

3528 Green, J. M.
Border effects in cotton variety tests.
Agron. J. 1956 : **48** : 116–18.

In tests carried out on dry land at three localities in Oklahoma, significant border effects on yield were observed when plots were planted with single rows of Parrott or Lankart 57 bordered on either side with single rows of Paymaster 54, Parrott, Dortch 1 or Lankart 57. On the basis of these results, trials in Oklahoma are now planted with 4-row plots in which only the centre two rows are harvested, instead of with 1-row or 2-row plots without guard rows.

3529 Turks, L.
(The new Soviet cotton variety 147F).
Hlopkovodstvo (Cott.-raising) 1956 : No. 4 : 39–43. [Russian].

This report on multiple hybridization at the Fergana Branch Research Station of the Cotton Institute describes 147F [304 (229 x 13656) x 98]. It is a high-yielding large-bolled variety, distinguished by greater earliness and better technological properties than the standard 108F. It shows resistance to wilt and gummosis. Mention is made of 147F, 144F and 150F, other recent selections also said to be superior to older varieties.

3530 Kulebjaev, V.
(The breeding of wilt-resistant varieties of fine-fibred cotton).
Hlopkovodstvo (Cott.-raising) 1956 : No. 3 : 45–48. [Russian].

This account of breeding for resistance to *Fusarium* at the Iolotanj branch of the Cotton Institute mentions new varieties, many of which combine high degree of resistance with early maturation, productiveness and good quality of fibre. Most resistant varieties have been obtained by interspecific hybridization between *Gossypium barbadense* and *G. peruvianum* or their derivatives.

3531 Avstriĭskiĭ, K.
(Trials of new cotton varieties at the Namangan State Varietal Station).
Hlopkovodstvo (Cott.-raising) 1956 : No. 5 : 44–45. [Russian].

In the 1955 trials in Uzbekistan, 147F (cf. Abst. 3529) and a number of other new early and midseason varieties outyielded the standard 108F. They also showed greater earliness and a higher degree of resistance to *Fusarium* wilt and gummosis. It is thought that the early varieties 147F and 315–2 might supersede 108F in the hilly districts of the Namangan province and the fine-fibred variety 5904I in the north-western areas of the Jangi-Kurgan and Čartak districts. The new midseason types 144F, S1581 and KR29 are regarded as suitable substitutes for 108F and S450–555 in the Namangan, Tjurja–Kurgan, Uiči and Čartak districts.

3532 Méndez, D.
Nematodes y selecciones de algodón Tangüis. (**Nematodes and selections of Tangüis cotton**).
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., Lima 1955 : **4** : No. 3 : 2–6.

Observations on a number of varieties showed little difference between them in degree of attack by *Heterodera marioni*; the varieties SNA 249 and LMW 395–42 were slightly less attacked than the rest but the differences were not reflected in the yields. The best lint yield was given by LM 1041–49.

3533 Plaut, M. & Marani, A.
Experiments with fibre flax varieties.
Ktavim, Rehovot 1955 : **4** : 43–48.

The results of trials of varieties from Europe, USA and Argentina in Israel are discussed. The following varieties merit further testing: Concurrent, Hollandia, Rembrandt, Wiera, Solido, Noblesse, Fivel, Liral Crown, Liral Prince and Liral Monarch.

3534 Mándy, Gy.
Újabb alaktani nézőpontok a lenfajták meghatározásához. (**New morphological aspects of the determination of flax varieties**).
Növénytermelés 1955 : **4** : 25–32.

The following characters have proved useful in distinguishing varieties: the length, width and shape of the leaf; the shape of the sepals and their degree of concrescence; and the shape of the capsule and its position relative to the calyx. A tentative key to the identification of the 26 most important Hungarian varieties is provided, based on the above features together with other flower characters.

3535 Smirnova, E. A.
(**Progress in flax production**).
Zemledelie (Agriculture) 1956 : No. 2 : 24–30. [Russian].

Reference is made to L 1120, a new variety bred at Smolensk. It produces high seed and fibre yields and shows resistance to disease, lodging and shedding. However, the technological properties of the fibre are not wholly satisfactory.

3536 Vasudeva, R. S., Sethi, C. L. & Lele, V. C.
New physiologic race of *Melampsora lini* (Ehrenb.) Lev., in India.
Indian Phytopath. 1955 : **8** : 199–200.

A fifth race (I_5) of *M. lini* occurring in India has been identified by its type of pathogenicity on the flax varieties Argentina and Koto.

3537 Mayo, G. M. E.
Linkage in *Linum usitatissimum* and in *Melampsora lini* between genes controlling host-pathogen reactions.
Aust. J. biol. Sci. 1956 : **9** : 18–36.

From a reanalysis of Flor's data on rust resistance genes in flax, it is shown that his postulate of three allelic series (cf. *PBA*, XVII, Abst. 1700) is based on incomplete evidence. His evidence for linkage between genes governing pathogenicity in the fungus (cf. *PBA*, XVII, Abst. 767) and for a gene-for-gene relationship between host and pathogen genes (cf. *PBA*, XXV, Abst. 1256) is also regarded as unsatisfactory. The need for more critical tests for allelism and linkage, using progeny of heterozygotes back-crossed to a universally susceptible variety, is stressed.

3538 Knowles, P. F., Houston, B. R. & McOnie, J. B.
Inheritance of resistance to Fusarium wilt of flax in Punjab 53.
Agron. J. 1956 : **48** : 135–37.

This is a full account of work summarized in Abst. 1041.

3539 Ceapoiu, N.
Soiul de cînepa ICAR–42/118. (**The hemp variety ICAR–42/118**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 541–52.

The above variety was obtained by selection of élites from Carmagnola hemp and subsequent crossing of these with Kastamonu and Bologna. It is superior to the standard Carmagnola-Cluj in stem and fibre yield and in uniformity of the fibres.

3540 Kuwada, H.
(**The effect of abnormal temperatures on pollen formation in the F_1 of *Hibiscus esculentus* x *H. manihot***).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 175–77. [Japanese].

Treatment with high, low, low→high and high→low temperatures decreased dyad frequency in the above hybrid. The most marked reduction followed treatment at 45° C.

3541 Katayama, Y.
(**Investigations of recently developed crops. IV. Ramie**).
Miyazaki Daigaku Nogakubu Kenkyu Jiho/Bull. Fac. Agric. Univ. Miyazaki 1956 : **1** : 176–78. [Japanese].

Data are provided on the growth rate, pollen dimensions and time of appearance of the male and female flowers of some recently introduced varieties and strains.

3542 Ure, J. S.
Manila hemp: a variety trial at the Federal Experiment Station, Serdang.
Malay. agric. J. 1955 : **38** : 256–61.

The varieties Tangongon, Bangulanon, Baguisanon, Serdang A, Serdang B and Serdang C have been tested at the above station in Malaya. Tangongon and Serdang C gave the highest yields of fibre. Tangongon is however considered to be superior to Serdang C since it entails lower handling costs, owing to the production of fewer but larger stems of high fibre content.

3543 Shinohara, S., Takehi, T. & Kawamura, M.
(**Studies on breeding varieties of *Luffa* resistant to *Fusarium* wilt. II. Selective breeding of single varieties in infested fields**).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 178–92. [Japanese].

In continuation of the researches summarized in Abst. 1497, the authors examined wilt-infested fields of a number of varieties to see whether wilt-resistant lines could be isolated. It appeared that most Japanese varieties are heterogeneous with respect to resistance and that selection is promising. Resistant lines of Daruma and Beikan [Rice Tube] are being carried forward.

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Proceedings of the Jamaican Association of Sugar Technologists for the year 1954.
J.A.S.T. Journal : **17** : Pp. 67.

3544 *Smith, C. E. M. Variety situation in Jamaica. (pp. 25–30).*

The shifts recorded previously in the variety situation continued in 1954 (cf. Abst. 537). The characteristics of the newer varieties B41227, B42231, B4362 and Co.331 are further discussed. Information is given on introductions now under trial.

3545 (**Abridged report of the results of sugar-cane variety trials during 1953–54**).
Taiwan Tangyeh Shihyenso Yenchiu Huiyen/Rep. Taiwan Sug. Exp. Sta. 1954 : No. 12 : 1–31. [Chinese].

Extensive data are provided on the yield, sugar production, disease resistance and agronomic characteristics of sugar-cane varieties under trial in Taiwan. The following high-yielding canes are singled out for special mention: 36–1119 (F86 x 1130/16A); 37–435 (POJ2878 x Co.356); 37–945 (233/11c x POJ2878), 38–483 (35–547 x Co.356), a vigorous cane; 38–669 (POJ2725 x F86), an early type; 38–1093 (34–257 x F46); 38–1227 (188/12c x F108); 38–1811 (34–257 x PSA31), a late cane; 38–2116, 38–2127 and 38–2134 (all from 188/12c x 341/14B); 38–2395 (F122 x PSA 31); 38–2452 (34–257 x POJ2878); and 39–3023 (Co.331 x 341/14B).

3546 **Progress report from experiment station departments.**
S. Afr. Sug. J. 1956 : **40** : 123–29.

A summary of a report submitted by the Experiment Station of the South African Sugar Association to the Experiment Station Committee is presented.
In a trial conducted in waterlogged ground, N : Co.376 has again given the highest yields. A successful crossing programme was carried out, a total of 132 crosses being effected. Of 601 seedlings tested as single lines, 45 have been selected for further trial.

3547 **Annual Report of the Mauritius Sugar Industry Research Institute, 1955** : Pp. 81 + XIV.

Further crossing was effected at Réduit and Pamplemousses, although the season was unfavourable for breeding, arrows being scarce and fuzz fertility impaired. As parents, R366 and R397 from Réunion Island were used for the first time, and Co.421, the highly vigorous cane M241/40, M381/51 (derivative of BH10/12) and M147/44 were used as parents on a larger scale. Seedlings are being selected in the first ratoon since this crop has proved to be more satisfactory for selection than plant cane. Of the locally developed varieties tested on the estates, M147/44 and M31/45 are to be added to the list of approved commercial canes. M147/44 is noteworthy for its high sucrose content when harvested early. M31/45 has outyielded M134/32 and equalled this cane in juice quality. It gives better results than M134/32 and Ebène 1/37 [Ebony 1/37] on soils which are periodically waterlogged. Percentage of open anthers declined with altitude in M63/39, Ebène 1/37, POJ2878, B34104 and Co.419 (cf. *PBA*, XXV, Abst. 3264). Density Brix and refractometric Brix are of equal value in predicting CCS percentage in breeding.

3548 Alvarez Conde, J.
Conceptos sobre la herencia. (**Concepts of inheritance**).
Bol. Asoc. Téc. azuc. Cuba 1956 : **15** : 311–15.

A brief explanation of the Mendelian laws is followed by examples of their application in producing improved varieties of sugar cane such as POJ2725, POJ2714, EK28 and POJ2364.

3549 LI, H. W., MA, T. H. & SHANG, K. C.
Cytological studies of sugarcane and its relatives. XI. Hybrids of sugarcane and corn.
Taiwan Sug. 1954 : **1** : No. 4 : 1–11.

In continuation of the researches summarized in *PBA*, XXV, Abst. 2236, a morphological and cytological description is given of F_1 hybrids between POJ2725 (O) and a native white floury maize (Z). Numerous seedlings were obtained but many aborted after attaining a height of 1–1½ ft. The modal chromosome number of the surviving hybrids was $2n = 117$. It is concluded that the genomic constitution of most of the surviving hybrids is OOZ; the aborted seedlings were probably OZ types. At meiosis, a multivalent was frequently noted and the number of univalents ranged from 4 to 11. These observations suggest that some degree of homology exists between the chromosomes of the parent species.

3550 LI, H. W., MA, T. H., YAO, S. Y. & SHANG, K. C.
Cytological studies of sugarcane and its relatives. XII. F_1 hybrids of POJ2725 x *Narenga porphyrocoma* (Hance) Bor.
Taiwan Sug. 1954 : **1** : No. 10 : 1–11.

In this number of the series (cf. Abst. 3549) the authors describe the morphology and cytology of F_1 hybrids of POJ 2725 x *Saccharum narenga* (= *N. porphyrocoma*). The F_1 progeny was fairly uniform morphologically; the chromosome number was $2n = 66–74$. Although various cytological aberrations such as nondisjunctional and laggard bivalents were noted, chromosome homology between the two parent species appeared to be high. This observation suggests that the two parent species are congeneric.

3551 LI, H. W., MA, T. H., YAO, S. Y. & SHANG, K. C.
Cytological studies of sugarcane and its relatives. XIII. Desynapsis and formation of restitutional nucleus in FP 40–22.
Taiwan Sug. 1955 : **2** : No. 6 : 13–25.

In this paper (cf. Abst. 3550) a detailed description is given of meiosis in FP40–22, a cane with *Miscanthus* and *Sorghum* in its ancestry. FP40–22 is desynaptic; bent spindles and restitution nuclei occur frequently.

3552 SHARMA, S. L., SRIVASTAVA, R. C., ALAM, M. N. & TRIVEDI, J. P.
Relationship between flowering age and height in *Saccharum spontaneum* Linn.
Curr. Sci. 1956 : **25** : p. 89.

A correlation coefficient of + 0·94 was found between plant height and number of days between germination and flowering among forms of *S. spontaneum* under investigation as possible progenitors of commercial canes at the Central Sugarcane Research Station, Pusa, Bihar.

3553 SHIH, S.-C., LEE [LI], L.-S., PENG, S. Y., SHUNG [TSUNG], T. & VENG [WENG], Y.
(Studies on the root system of sugar cane).
Taiwan Tengyeh Shihyenso Yenchiu Huiyen/Rep. Taiwan Sug. Exp. Sta. 1954 : No. 12 : 32–47. [Chinese].

Intervarietal differences in root development were noted. The variety F134, which is noted for its wide adaptability, developed the most abundant root system.

3554 MUKHERJEE, S. K.
Revision of the genus *Saccharum* Linn.
Bull. bot. Soc. Beng. 1954 : **8** : 143–48.

Descriptions are given of the five species recognized as distinct. viz. *S. officinarum* (usually $2n = 80$), *S. spontaneum* ($2n = 54–120$), *S. sinensis* ($2n = 116–120$), *S. barberi* ($2n = 82–124$) and *S. robustum* ($2n = 60–120$, usually 80).

3555 BUZACOTT, J. H.
Wild cane collection in India.
Cane Gr. quart. Bull. 1956 : **19** : p. 125.

A short account is given of the scheme sponsored by the Indian Central Sugar Cane Committee for collecting representatives of *Saccharum spontaneum*, which are subsequently maintained at Coimbatore.

3556 **Introduction of foreign cane varieties into Taiwan during 1951–1955.**
Taiwan Sug. 1955 : **2** : No. 8 : 21–24.

A list of 121 varieties imported into Taiwan in the above period is presented with notes on their economic or breeding value.

3557 LO, T. T.
N : Co.310 highly resistant to the root parasite bunga.
Sug. J., N. Orleans 1955 : **18** : 46–47.

Varietal differences in sugar cane as regards resistance to the parasitic plant *Aeginetia indica* are noted. In trials in Taiwan N : Co.310 and COX proved highly resistant and F134 moderately resistant. The varieties F110, POJ2883, POJ3016 and PT43–52 were susceptible (cf. Abst. 3558).

3558 Lo, T. T.
N : Co310 highly resistant to the root parasite bunga.
Taiwan Sug. 1955 : **2** : No. **4** : 18–20.

The sugar canes N : Co310 and COX have both proved resistant to *Aeginetia indica* in tests conducted at the Pingtung Improvement Station, Taiwan (cf. Abst. 3557).

3559 Abbott, E. V.
Sugarcane diseases and pathology of Taiwan. Report on a study of research program in pathology and breeding of Taiwan Sugar Experiment Station, November 16, 1955–January 5, 1956.
Taiwan Sug. 1956 : **3** : No. 2 : 13–19.

A short review is given of the significance of sugar-cane diseases in Taiwan and of the organization of phytopathological research in the island. The dangers of monoclonal culture based exclusively on N : Co. 310 are pointed out.

3560 Chu, T. L., Liu, H. P. & Li, C. Y.
Preliminary studies on the mode of resistance of sugarcane varieties and its relatives to the leaf-scorch disease. Part I—Natural infection.
Taiwan Sug. 1955 : **2** : No. 2 : 15–20.

Information is provided on varietal differences in the degree of infection by *Stagonospora sacchari* under field conditions in Taiwan. The most resistant commercial cane is Trojan. POJ 2725 would appear to be a useful parent in breeding for resistance. The genera *Erianthus*, *Miscanthus*, *Narenga* and *Zea* are resistant.

3561 Miranda de Onís, J. & Bernaldo de Quirós, A. G.
Ensayos comparativos de variedades de remolacha azucarera 1954. (**Comparative tests of sugar-beet varieties, 1954**).
An. Inst. nac. Invest. agron., Madr. 1955 : **4** : 489–530.

Observations were made on 16 varieties in connexion with the Spanish register of sugar-beet varieties. In several areas the highest yields of sugar per unit area were given by the varieties Adega 17 and Polybeta.

3562 Aldrovandi, A.
Orientamenti del miglioramento genetico della bietola zuccherina. (**New directions in the genetic improvement of sugar beet**).
Sementi elette 1956 : **2** : No. **4** : 34–41.

It is pointed out that the Italian varieties resistant to *Cercospora*, all derived from Munerati's crosses with wild beets, are somewhat later in maturity than susceptible varieties, which can therefore be grown with advantage in areas not subject to *Cercospora* attack, since they are generally slightly more productive. In southern Italy where beet is sown in autumn, freedom from bolting is an important consideration, the best variety in this respect being Cesena NSA.

Comments are made on the use of hybrid seed in the USA and of polyploids in Europe, the use of which is producing increases of up to 30% in the yield of sugar per unit area.

3563 Zucchini, M.
Il seme di barbabietola ed i progressi della coltura. (**Sugar-beet seed and progress in its cultivation**).
Ital. agric. 1956 : **93** : 426–34.

The progress of sugar-beet breeding in Italy is outlined and figures are quoted which show that the yield of sugar per unit area in the period 1951–53 was consistently higher with Italian than with imported varieties. In 1954–56 the polyploid varieties such as Maribo, Hilleshög and Klein Polybeta gave the best sugar yields under normal conditions and Cesena NSA and Kleinwanzleben AA were best in autumn sowings, being almost free from bolting. In 1955 an average yield of 50 c. per ha. was attained.

3564 Archimowitsch, A.
Selection of sugar beets in the USSR.
Beet Sug. Developm. Found., Fort Collins, Colo. 1955 : Pp. 60. (Mimeographed).

Sugar-beet breeding is surveyed in detail, under the following chapter headings: original material for selection; aims of selective breeding work at Soviet breeding stations; methods of selection; the method in inbreeding; significance of related propagation in selection; methods for producing new varieties at Soviet breeding stations; evaluation of varieties and the Soviet method of releasing them for planting; methods of selection used to eliminate the undesirable effects of close breeding; special methods and directions for selection; breeding technique; and the modern network of breeding stations in the USSR and varieties grown. Lists of (1) various publications providing information on sugar-beet breeding and cultivation the USSR and (2) the literature cited are appended. An abridgement of the review, with some additional material, has already been referred to in Abst. 2661.

3565 Wauthy, R. & Roussel, N.
Les résultats des essais comparatifs de variétés de betterave sucrière en Belgique de 1951 à 1955. (**The results of sugar-beet variety trials in Belgium from 1951 to 1955**).
Publ. Inst. belge Amélior. Better. 1955 : **23** : 233–34.

Tabulated data are presented on the results of trials conducted in 1951–55 at a number of centres and on different types of soil in Belgium. Among the varieties giving high yields of roots, sugar and leaves were Hilleshög R Polyploid, Kleinwanzleben Polybeta, Maribo P and Zwaanesse III E. Kleinwanzleben E and Kleinwanzleben N proved highly resistant to bolting. Eagle Hill N, Kleinwanzleben Polybeta and Desprez N had the highest sugar contents.

3566 Meier, W.
Ergebnisse der Sortenprüfung bei Zuckerrüben 1953–55. (**Results of variety trials of sugar beets, 1953-55**).
Mitt. schweiz. Landw. 1956 : **4** : 52–54.

The results of trials at the Lausanne, Liebefeld-Bern and Zürich-Oerlikon Experimental Stations are summarized in tabular form. Kleinwanzleben Polybeta and Kleinwanzleben E gave the highest yields of sugar per given area and were also more resistant to *Cercospora beticola* than Cesena Z and Cesena Za, the other two varieties included in the trials.

3567 Oldemeyer, R. K. & Brewbaker, H. E.
Interspecific hybrids in the genus Beta.
J. Amer. Soc. Sug. Beet Tech. 1956 : **9** : 15–18.

In further hybridization of species of sect. *Vulgares* with members of sect. *Patellares* at the Great Western Sugar Company, Longmont, Colo. (cf. Abst. 1549), F_1 hybrids of the table beet Detroit Dark Red with *B. procumbens* and *B. webbiana* were highly sterile. Two hybrids obtained from *B. maritima* PEI206411 from Turkey x *B. procumbens* have flowered but upon pollination by sugar beet only one of the plants produced seed; back crossing of the progeny of this plant to sugar beet is in progress in the hope of incorporating the nematode resistance and other desirable characteristics of *B. procumbens* in a sugar-beet type.

Species of sect. *Corollinae* are of interest as possible sources of cold resistance and cytoplasmic male sterility. A perennial hybrid of sugar beet x *B. intermedia* which has survived 12 winters without protection has been produced but observations on its progeny suggest that little homology exists between the chromosomes of the two species. Natural crossing occurred between $2n$ and $4n$ male-sterile sugar beet on the one hand and *B. lomatogona*, *B. intermedia* and *B. trigyna* on the other.

3568 Johnson, R. T.
A grafting method to increase survival of seedlings of interspecific hybrids within the genus Beta.
J. Amer. Soc. Sug. Beet Tech. 1956 : **9** : 25–31.

Details are given of a method of grafting by means of which a satisfactory percentage of survival has been secured among F_1 hybrid seedlings obtained by open pollinating ♂ sterile sugar beet with *B. patellaris*, *B. webbiana* and *B. procumbens* at Spreckels Sugar Company, Calif. The stock consists of bolting sugar beet. All the hybrids bolted but only 60% of them flowered; pollen sterility was complete. The seed produced by only 40% of the flowering plants when supplied with sugar-beet pollen was extremely low in viability. The eight back-cross seedlings obtained required grafting for survival and closely resembled sugar beet in appearance.

Matsumura, S. (Editor).
(**Improvement of sugar beets by means of triploidy**).
Nat. Inst. Genet. and Kihara Inst. Biol. Res., Tokyo 1953 : No. 14 : Pp. 134. [Japanese].

3569 *Matsumura, S.* (*Plans and progress with reference to triploid sugar beet*). (*pp. 1–2*).

A short conspectus of the history of triploid sugar-beet production in Japan is given. Research work on this subject began in 1940 at the Kihara Institute for Biological Research. Other research institutes which are now working in this field include the National Institute of Genetics and research institutes in Kyoto and Hokkaido. Commercial companies concerned with sugar-beet growing and sugar manufacture have contributed financial support to the research programme.

3570 *Matsumura, S. & Mochizuki, A.* (*The induction of triploid sugar beets and their characteristics*). (*pp. 3–13*).

A comparative study of $2x$, $3x$ and $4x$ strains of sugar, forage and table beet varieties is presented. The $4x$ strains were produced by colchicine treatment and the triploids by interplanting $2x$ and $4x$ plants. Data are provided on pollen characteristics, leaf and root yield, Brix and sugar content. The relative yielding capacity is $3x>4x>2x$, Brix values are in the order $4x>3x>2x$. The principal defect of the triploids, which provide the greatest sugar output per root, is poor germinability.

2571 *Mochizuki, A.* (*Cytological and genetical studies on sugar beet. V. Cytogenetical studies on the production of triploid sugar-beet seed*). (*pp. 14–39*).

In continuation of the researches summarized in *PBA*, XXII, Abst. 591, the author investigated the cytology of $4x$ sugar beets and the production of $3x$ seed. The modal meiotic configuration of the tetraploids is $1_{IV} + 16_{II}$. It was found that x pollen tubes germinate more quickly on both $2x$ and $4x$ stigmas than $2x$ pollen tubes. The defective germinability of $3x$ seed is largely due to embryo abortion. Optimum arrangements for interplanting $2x$ and $4x$ strains for the commercial production of triploids are discussed.

3572 *Nagao, S. & Takahashi, M.* (*Studies on polyploid varieties of sugar beet. I. On the development of the pollen and on the artificial germination of the pollen*). (*pp. 40–53*).

A description is given of pollen development in $2x$ and $4x$ sugar beet and of meiosis in the tetraploids. The modal quadrivalent number in the tetraploids was 6_{IV}. Laggard chromosomes, bridges and multipolar spindles were also noted. Artificial germination of x and $2x$ pollen was also studied. The optimum medium discovered consisted of 1% agar : 25% sucrose : 1% peptone : 0·005% boric acid, at pH 5·4.

3573 *Nagao, S. & Takahashi, M.* (*Studies on polyploid varieties of sugar beet. II. Comparison of the characters of tetraploids and diploids*). (*pp. 54–68*).

A detailed comparison is made of $2x$ and $4x$ sugar-beet strains in respect of vegetative period and mode of flowering, plant size, number, shape and pH of leaves, stomatal size, pollen size and fertility.

3574 *Nagao, S. & Takahashi, M.* (*Studies on polyploid varieties of sugar beet. III. Data for breeding triploid varieties*). (*pp. 69–75*).

Miscellaneous information likely to be of value in breeding triploids is brought together. The topics covered include pollen germination (cf. Abst. 3572), differences between $2x$ and $4x$ sugar beets (cf. Abst. 3573), chromosome numbers in the progeny of tetraploids, and germination rate in $2x$, $3x$ and $4x$ strains.

3575 *Hosokawa, S., Sawai, I. & Shichiji, M.* (*Comparison of physiological characters in the initial stage of growth of diploid and tetraploid sugar beets grown in water culture*). (*pp. 76–85*).

The diploid strains exceeded the tetraploids in germination rate, growth rate, yield of tops and roots, osmotic pressure and photosynthetic rate.

3576 *Hosokawa, S., Nakajima, J., Kato, K. & Takeda, T.* (*Results of experiments with polyploid sugar beets*). (*pp. 86–99*).

An extensive series of trials of $2x$, $4x$ and derived $2x$ x $4x$ hybrids at the Hokkaido Agricultural Experimental Station is reported. Data are provided on germination rate, yield of tops and roots, and sugar content. The most outstanding performance was by the triploid $3n$–1 [4398 ($4x$ strain of Honiku 398) x 162–A].

3577 (*Results of various experiments with triploid sugar beets*). (*pp. 100–10*).

Experiments with sugar-beet strains, mainly triploids, carried out in Hokkaido by the Japanese Beet-Sugar Manufacturing Company are reported. The characteristics investigated were disease resistance, yield, sugar content, germination rate and flowering time. As in the experiment reported in Abst. 3576, the most promising strain was the triploid 4398 x 162–A.

3578 *Matsumura, S.* (*A review of the results obtained in investigations of triploid sugar beets*). (*pp. 111–20*).

Investigations in Europe and North America on polyploid sugar beets are reviewed and compared with the results obtained in Japan.

3579 *Matsumura, S. Improvement work with sugar beets by means of triploidy. A concluding review.* (*pp. 120–29*).

A synopsis in English of the principal results of the preceding papers is presented.

3580 AGARKOV, V. A.
(The effects of microelements upon the yield of sugar beet and its resistance to diseases).
Zemledelie (Agriculture) 1956 : No. 1 : 71–75. [Russian].

At Uladovo-Ljulenec, plants of U752 and Cerkosporoustoĭčivyĭ [Cercospora-resistant] gave progenies with improved heritable properties when raised from seed soaked in weak aqueous solutions of $MnSO_4$ or H_3BO_3. Data are provided on improvements in root yields, sugar contents and resistance to *Cercospora*, *Botrytis* and root weevil.

3581 **Hybrid monogerms open a new era of sugar beet production.**
Utah & Ida. Cult. 1956 : **16** : 3–7, 43.

A popular account is given of the research which has led to the development of monogerm hybrids in the USA. Such hybrids may give up to 25% higher yields of roots than ordinary commercial varieties, and 90% or more of single plants. Their sucrose content is high. In cooperation with the US Department of Agriculture, the Utah-Idaho Sugar Co. is engaged upon a programme of large-scale seed production of the monogerm hybrids, with the aid of male-sterile lines.

3582 Margara, J. & Touvin, H.
Sélection de betteraves sucrières résistantes au *Cercospora*. (**Breeding sugar beets resistant to *Cercospora***).
CR Acad. Agric. Fr. 1956 : **42** : 71–73.

Work at the Central Plant Breeding Station, Versailles, on breeding for resistance to *C. beticola* is summarized briefly. Trials showed that resistant varieties, although producing higher yields than susceptible varieties under conditions of severe infection, are 12–18% less productive than susceptible varieties in the absence of the disease. In addition, resistant introductions from countries with a warm climate, e.g. Italy and the southern USA, tend to bolt when grown in France.

The problem confronting French sugar-beet breeders is therefore to combine disease resistance with high yields. At Versailles, the production of F_1 hybrids from crosses between different resistant families and the development of tetraploid and triploid strains have given promising results. Preliminary results suggest that resistance to *C. beticola* depends on a system of polygenes.

3583 Swink, J. F. & Finkner, R. E.
Galactinol-weight relationships in breeding for resistance to the sugar beet nematode.
J. Amer. Soc. Sug. Beet Tech. 1956 : **9** : 70–73.

In tests carried out at the American Crystal Sugar Company, Rocky Ford, Colo., on sugar-beet material selected for resistance to nematode (*Heterodera schachtii*), an inverse relationship was found between yield and content of galactinol, a substance known to stimulate the cysts to hatch. Galactinol content may therefore be of value as a criterion in selecting for nematode resistance.

3584 Miège, J. & Miège, M.-N.
Recherches sur la stérilité chez le manioc. (**Researches on sterility in cassava**).
Rev. Cytol., Paris 1954 : **15** : 179–94.

A male-sterile variety (H36) and a male-fertile variety (B20) both showed normal pollen meiosis. In B20, 60% of the pollen grains were fertile and above 130 or 135μ in diameter, the remaining defective pollen grains being smaller. In the male-sterile variety, the pollen grains degenerated after tetrad formation and the anthers became withered and empty.

3585 Mizuno, S.
(**On the production of the varieties Nagaimo and Ichoimo from the Yamatokurokawa yam**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **24** : 207–08. [Japanese].

The Yamatokurokawa [Japanese Black-skinned] yam varies considerably when reproduced vegetatively. Two vegetative selections, Nagaimo [Long Tuber] and Ichoimo [Ginkgo Tuber] are described. They contain more starch than the unselected variety.

3586 Miège, J.
Nombres chromosomiques et répartition géographique de quelque plantes tropicales et équatoriales. (**Chromosome numbers and geographic distribution of some tropical and equatorial plants**).
Rev. Cytol., Paris 1954 : **15** : 312–48.

Somatic chromosome numbers were studied in 18 species of *Dioscorea*, 14 Sapotaceous species and ten species pertaining to the Annonaceae, Bignoniaceae, Burseraceae, Icacinaceae, Meliaceae and Papilionaceae. Among the Sapotaceae ($x = 10$, 12 or 13) the chromosomes were large and no polyploids were observed. In *Dioscorea* ($x = 9$, 10 and 12), species occurring in Europe had a low chromosome number ($2n = 20$ or 24) and large chromosomes, while species with an equatorial distribution generally had higher numbers, the highest being $2n > 120$, and smaller chromosomes.

STIMULANTS

3587 Moore, E. L. & Drolsom, P. N.
Dixie Bright 244.
Res. & Fmg. 1956 : **14** : No. 3 and 4 : p. 4.
A tobacco from Carolina.
Sth. Seedsman 1956 : **19** : No. 5 : 26, 59.
New tobacco variety, Dixie Bright 244, released to growers.
What's New Crops Soils 1956 : **8** : No. 6 : p. 27.

Dixie Bright 244, developed by the North

Carolina Experiment Station and the US Department of Agriculture from (Dixie Bright 102 x Bottom Special) F_2 x Dixie Bright 101, equals Dixie Bright 101 in resistance to Granville and *Fusarium* wilts and is superior in blackshank resistance and in resistance to damage by wind and hail; it gives 15–19% higher yields.

3588 Takenaka, Y.
(Cytological studies of *Nicotiana* plants. VII. Meiosis in F_1 hybrids between plants of *tomentosa* lineage and 3 other species).
Senshokutai (Chromosome)/Kromosomo 1955 : No. 25–26 : 929–35. [Japanese].

Further to the researches summarized in Abst. 565, the author describes the morphology and cytology of (1) *N. glauca* x *N. otophora*, (2) *N. sylvestris* x *N. tomentosiformis* and (3) *N. paniculata* x *N. otophora*. In (1) the modal bivalent-number was 5_{II}; one or rarely two heteropycnotic bodies were present during prophase. In (2) the modal number of bivalents was 4_{II}. The modal number of bivalents in (3) was 7_{II}. It is concluded that the *paniculata* genome pairs with the *tomentosa* rather than with the *sylvestris* genome.

3589 Sparrow, A. H., Gunckel, J. E., Schairer, L. A. & Hagen, G. L.
Tumour formation and other morphogenetic responses in an amphidiploid tobacco hybrid exposed to chronic gamma irradiation.
Amer. J. Bot. 1956 : **43** : 377–88.

Exposure of *Nicotiana glauca* x *N. langsdorffii* amphidiploids to chronic gamma radiation for 64 days caused the production of 53·2% tumorous plants; 0·1% of the controls developed tumours. The possible role of growth hormones and nutritional, cytological and genetic factors in tumour formation is touched upon.

3590 Paxman, G. J.
Differentiation and stability in the development of *Nicotiana rustica*.
Ann. Bot., Lond. 1956 : **20** : 331–47.

"A set of diallel crosses between five varieties of *Nicotiana rustica* was grown in two successive seasons. The stability of two floral characters, pistil and stamen lengths, was measured using the within plant variances estimated by recording from three flowers on every plant. Variation is found between the varieties in respect of stability, but the inbred parents as a whole do not differ from the mean F_1. Analysis demonstrates nuclear inheritance of the differences and some genotype environment interaction across the two seasons.

"The leaf-shape index is found to vary between nodes in two ways: 1. In a regular manner from node to node approaching a more lanceolate form, the rate of change being characteristic of each variety. 2. By fluctuations about this pattern which are interpreted as instability of development comparable to that examined in the flowers.

"Both types of variability show the characteristics of quantitative inheritance, and it is suggested that as the two systems must act through a common cytoplasm during ontogeny, this may account for a positive correlation observed between their phenotypic expressions.

"Within-plant variations of stamen lengths and pistil lengths are shown to reflect a common stability of the sexual organs. Since flower and leaf stability are found to be independent, there is some evidence that control is not general throughout the plant." [Author's summary].

3591 Suk, A. V.
(Standardization of tobacco varieties in Kirgizia).
Tabak (Tobacco) 1956 : No. 1 : 29–30. [Russian].

Reasons for continued cultivation of the aromatic varieties Ostrokonec [Pointed-tip] and Samsun in preference to the large-leaved Trebizond are given. In particular, they are distinguished by greater earliness and superior leaf quality. The quality of Trebizond in Kirgizia is inferior to Trebizond from Krasnodar, Armenia and Azerbaĭdžan.

3592 Bolsunov, I.
Ist es möglich, Tabake zu züchten, die gegen Saatbeetkrankheiten widerstandsfähig sind? **(Is it possible to breed tobacco varieties that are resistant to seed-bed diseases ?)**
Tabakpfl. Öst. 1956 : **7** : 6–7.

In this popular article the author stresses the importance of sowing tobacco seeds in sterilized soil. At the Fürstenfeld Tobacco Breeding Station, Austria, emphasis is being placed on breeding for resistance to soil microorganisms and a number of highly resistant new varieties of Burley tobacco, such as Big Burley, Phönix, Speranza and Troll, are undergoing their final trials. The disease resistance of Sabolz, helle Virginia [light Virginia] and Debrecen is also being improved by selection.

3593 VASILJEV, A. F.
(Some results of tobacco varietal trials).
Tabak (Tobacco) 1956 : No. 1 : 28–29. [Russian].

The standard Samsun 940 was the only variety among those tested in recent years in Georgia which combined good quality with high yield. It is tolerant of low temperatures and shows resistance to *Thielaviopsis basicola* and to a lesser degree to mosaic.

3594 VASILJEV, A. F.
(Some results of tobacco varietal trials in the Krasnodar territory).
Tabak (Tobacco) 1956 : No. 2 : 46–48. [Russian].

In recent trials, Trebizond 93, Trebizond 1867 and Ostrolist B2747 [Pointed-leaf B2747] have surpassed all other varieties in yield and leaf quality in the mountainous districts; Ostrolist B2747 proved the best variety for the plains. Varieties still under trial include Suhumi 959, which is outstandingly productive of high-quality leaves under the conditions along the Black Sea Littoral, and the *Thielaviopsis*-resistant Ostrolist 450 (Ostrolist B2747 x Trebizond KV2736) from the Tobacco Institute. This outyields Trebizond 93 and Ostrolist B2747 and produces leaves of superior quality.

3595 ADSUAR, J. & LÓPEZ MATOS, L.
Reaction of some Nicotiana species to the pepper- and common tobacco-mosaic viruses.
J. Agric. Univ. PR 1955 : **39** : 168–71.

Of 24 species tested, *N. glauca* remained free of pepper mosaic virus after inoculation, *N. tomentosiformis* remained symptom-free but extracts of its juice caused symptoms in Large Bell Hot pepper, and *N. otophora* plants were all symptom-free and all except one were free of the virus. *N. glauca* was also resistant to tobacco mosaic virus.

3596 WIGHT, W.
Commercial selection and breeding of tea in India.
World Crops 1956 : **8** : 263–68.

This popular article describes the regional variation in the tea plant and its product in India as a whole and, with reference to Assam, the production of mass-selected seed by commercial growers, clonal selection, and hybridization to combine the desirable characters of the Assam type with adaptability to a wider range of conditions.

3597 TOMO, N., HUCHINOUE [FUCHINOUE], Y. & YAMANE, H.
(On the germination of tea pollen).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **24** : p. 111. [Japanese].

Pollen preserved at 5–7° C. at 60% relative humidity would still germinate on artificial media after 31 days; the capability of fertilization, however, was lost considerably before this.

3598 SANDERS, F. R.
Twenty-first annual report of the Coffee Research and Experimental Station, Lyamungu, Moshi for the 1954/55 season.
Pamphl. Tanganyika Dep. Agric. 1955 : No. 61 : Pp. 40.

The results of trials of clonal and seedling selections are reported in detail. Clones KP423, KP162, H66, KP154, KP227 and X321, all of which were derived from the variety Kent, maintained their superiority in yield.

3599 GUDE, C. J.
Enige gedachten betreffende Robustaselektie naar aanleiding van het plantadvies 1956. **(Some thoughts concerning the selection of Robusta in connexion with the 1956 planting recommendation).**
Bergcultures 1956 : **25** : 159–65.

Criteria employed in selecting and testing Robusta planting material at the Djember Research Station, Java, are outlined; breeding objectives include increased productivity, larger beans and improved resistance to diseases. Considerable importance is attached to carrying out trials under as wide a range of ecological conditions as possible to ensure that any given clone is adapted to the environment for which it is recommended. Two new legitimate seedlings, SA24 x BP42 and SA34 x BP42, both of which were obtained at the Sumber Asin station, outyield BP42. BP42 and BP39 are at present the only clones recommended for large-scale plantings throughout Java (cf. Abst. 2693).

3600 SACCAS, A. M.
Recherches expérimentales sur la trachéomycose des caféiers en Oubangui-Chari. **(Experimental research on tracheomycosis of coffee trees in Oubangui-Chari).**
Agron. trop., Nogent 1956 : **11** : 7–38.

Information is given on the symptoms caused by *Fusarium xylarioides*, ways in which it spreads and methods of control. Selection for resistance at the Central Station of Phytopathology, Boukoko, French Equatorial Africa, has given rise to two strains of *Coffea excelsa*, A86 and A161, that are immune and two strains of *C. robusta*, B10 and B445, that are highly resistant. Three physiological races of the pathogen, differing in degree of virulence, were isolated.

3601 Owen, H.
Further observations on the pathogenicity of *Calonectria rigidiuscula* (Berk. & Br.) Sacc. to *Theobroma cacao* L.
Ann. appl. Biol. 1956 : **44** : 307–21.

The investigations described include tests of the reaction of cacao clones inoculated with *C. rigidiuscula*, the chief fungus causing die back after damage by mirids in the Gold Coast. Amelonado and Trinitario clones apparently varied in susceptibility but the plant-to-plant variation was too great to permit the drawing of any conclusions. Some Upper Amazon selections were only moderately susceptible and merit retesting.

3602 Desrosiers, R., Bolaños, C. W. & Vargas, J.
Evaluación de clones de cacao en relación con su resistencia a la escoba de bruja (*Marasmius perniciosus*, Stahel). [**Evaluation of cacao clones in regard to their resistance to witches' broom (*M. perniciosus* Stahel)**].
Turrialba 1955 : **5** : 78–82.

A modification of Pound's criterion is proposed, consisting of the average number of brooms produced by all members of a clone divided by the age of the clone in years. A table of these quotients for 77 five-year old clones is presented; only five of them had a quotient lower than 1·0 for the two years in which observations were made, namely 1951 and 1953, and are considered to be probably resistant.

3603 Burgos L., J. A.
Posibilidades industriales del cacao Pound en el Perú. (**Industrial possibilities of Pound cacao in Peru**).
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., Lima 1955 : **4** : No. 2 : 8–11.

Observations on a number of Pound's clones resistant to witches' broom have shown that they vary widely in yielding ability; clone 2230–7 is the best in this respect, some trees having produced over 3 kg. of cocoa in 1954 when they were 5½ years old. In yield the Pound clones therefore compare with the cacaos previously grown in Peru, while in quality they are rated as medium.

3604 Hlaváčková, Z.
Šlechtění máku na zvýšený obsah morfinu. (**Breeding the poppy for high morphine content**).
Preslia 1955 : **27** : 368–82.

A number of hybrids with good morphine content have been obtained by crossing Dutch or Czechoslovakian varieties rich in morphine with others possessing similar properties. At Prague, the hybrids between Noordster [North Star] on the one hand and Mansholt, Nobel, Dětenice, Hokešův, Chlumec and Libverdský on the other had the highest morphine values. At Větrov, most hybrids had a higher morphine content than the higher parent; the highest values were obtained from hybrids of Vahovecký with Hokešův, Chlumec and Noordster.

3605 Ono, T.
(**Studies on hops. I. The chromosomes of hops and related types**).
Bull. Brew. Sci., Tokyo 1955 : **2** : 3–66. [Japanese].

An extensive study of the cytology of *Humulus lupulus* and *H. japonicus* is reported. In male plants of *H. lupulus*, the chromosomes may be homozygotic or heterozygotic, or a quadrivalent association involving the sex chromosomes may be formed. The inheritance of sex-chromosome type appears to be patroclinous.

The caryotype of *H. lupulus* is of the form $2(v_1 \ldots v_6 + j + i_1 + i_1 \ldots i_3)$.

H. lupulus var. *cordifolius* has a similar caryotype to the preceding and shows a similar range in sex-chromosome type.

In *H. japonicus* ♀, $2n = 14 + XX$, ♂, $2n = 14 + XY_1Y_2$. In some males, a pentavalent sex-chromosome association is formed. A heteromorphic autosomal pair occurred sometimes too. In colchicine-induced tetraploids of this species, two trivalent sex-chromosome associations and quadrivalent autosomes are usually formed The typical autosome caryotype formula is $2(v_4 \ldots v_6 + j + i_1 \ldots i_3)$.

MINOR CROP PLANTS

3606 Baldini, E.
La coltura ed il miglioramento del peperone. (**The cultivation and improvement of peppers**).
Orticoltura italiana. Riv. Ortoflorofruttic. ital. 1956 : **40** : Num. Spec. 197–206.

The cultivars of *Capsicum annuum* grown in Italy belong to six botanical varieties (cf. *PBA*, XXII, Abst. 1348) and are described and illustrated. Cross pollination is not infrequent and many of the varieties are genetically mixed and can be improved by selection. Brief directions are given for carrying out the selection operations.

3607 BURAKOVA, M. I.
(Experiments on growing *Capsicum* and egg plant in Moscow).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 21 : 63–68. [Russian].

A number of strains of various origin have been tested. Among the *Capsicum* varieties, Dlinnyĭ Želtyĭ [Long Yellow] and Kalinkovskiĭ were distinguished by earliness, the former, together with Bolgarskiĭ 079 [Bulgarian 079], Krasnyĭ Express [Red Express] and a few others, being also notable for high yield. All these varieties came from Moscow or Kiev. Two races of the egg plant Fioletovyĭ Karlik [Mauve Dwarf], one from Germany and the other from Kiev, outyielded all others by a good margin. Maĭkop, originating from Kiev, was the next best.

3608 KORMOS, J. & KORMOS, J.
Adatok a klorofillhiányosság genetikájához. **(Data on the genetics of chlorophyll deficiency).**
Ann. Inst. biol., Tihany 1955 : **23** : 177–86.

Two maternally inherited types of variegation, albomaculata and pallidomaculata, and four genically controlled chlorophyll mutations in red pepper are described. Three of the latter are lethal, viz. viridis, a monogenically determined character giving pale green plants, and xantha$_1$ and xantha$_2$, both resulting in plants without any chlorophyll, the first governed by one gene and the second by two; the fourth mutation, designated chlorina, is nonlethal. The lethal mutants grew when supplied with sugar solution. Normal green F_1 progenies were obtained on crossing the mutants *inter se*, with normal plants or with albomaculata male parents. The F_2 progenies investigated yielded the following segregation ratios: in chlorina x viridis, 9 normal : 4 chlorina : 3 viridis; in chlorina x xantha$_1$, 9 normal : 4 xantha$_1$: 3 chlorina; and in viridis x xantha$_1$, 9 normal : 4 xantha$_1$: 3 viridis.

3609 KORMOS, J. & KORMOS, J.
Az oltási affinitásról. **(Affinity in grafting).**
Ann. Inst. biol., Tihany 1955 : **23** : 161–75.

When grafted on to tomato stocks, the *Capsicum annuum* varieties Cerasiforme 1 and Longum nigrum luteum both grew well but lines of the variety Paradicsom alakú [Tomato-shaped] proved incompatible; other scion varieties were intermediate in growth. In the reverse grafts, tomato scions grew equally well on all pepper stocks in the greenhouse but rather less well on some stocks in the field. Incompatibility of pepper scions grown on stocks of tomato or *Solanum sisymbrifolium* appeared to be determined by a single dominant factor; in the same scions grown on *Datura metel* dominance of incompatibility was incomplete. In double grafts the degree of union depended on the relative positions of the compatible and incompatible components. Incompatibility appeared to be unrelated to suction pressure and attempts to distinguish compatible and incompatible varieties by serological tests or by testing the germination of pepper pollen on tomato stigmas and *vice versa* proved unsuccessful. Grafting prior to crossing had no effect on cross compatibility.

3610 MARJJANOVIČ, E. V.
(The Procev pepper).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 5 : 31–32. [Russian].

Procev, cultivated in the Kiev province, is characterized by great earliness and a high quality product, but its yield is normally low unless it is grown in the shade. More productive forms have recently been obtained at the Kiev breeding station by selecting families more tolerant of light. These may produce 2·00–2·19 kg. per m.^{2} as against 1·22 kg. per m.^{2} in the initial population.

3611 HARE, W. W.
Resistance in pepper to *Meloidogyne incognita acrita*.
Phytopathology 1956 : **46** : 98–104.

A short account of this work has been summarized in Abst. 2094.

(USSR Oil Plants Institute. Short report on scientific research for the year 1952). 1953 : Pp. 323. [Russian].

3612 *Ždanov, L. A. (The results of studying different sunflower varieties under irrigation). (pp. 5–11).*

Midseason varieties grown on irrigated land at the Don Research Station showed improvements in their oil contents. The increases were more noticeable among varieties with a shorter growth period than others, amounting to 6·83% as against 5·66%.

3613 *Pustovoĭt, V. S.* (*Breeding and seed growing of the sunflower*). (*pp. 12–21*).
This account of varietal trials at Krasnodar for the period 1949–52 mentions a number of early and midseason varieties from Krasnodar, Veĭdelevka and the Don Research Station, distinguished by productiveness and high oil content. Material still under trial includes lines 13484 and 13485 with respective oil contents of 49·97% and 50·16%. A brief description is given of G1219, which is referred to as an interspecific rust-resistant hybrid. It has higher seed and oil yields than VNIIMK 1646 [Oil Plants Institute 1646] and a lower husk content.

3614 *Romanjuk, G. T. & Ščerbina, V. I.* (*Breeding and seed growing of the sunflower*). (*pp. 22–29*).
This report on breeding work at Armavir refers to new varieties 3–5% higher in oil than VNIIMK 1646 and surpassing it in *Orobanche* resistance. Some, notably varieties 9067 and 8783, are distinguished by great earliness.

3615 *Umen, D. P.* (*Breeding the groundnut*). (*pp. 30–38*).
Varieties of *Arachis* bred in recent years at Krasnodar include the standards Stepnjak [Steppe], VNIIMK 1657 and Adyg, all productive and early types suitable for combine harvesting. Among the newer varieties, 3137, 3643 and 3136 are notable for large pods. Many others are distinguished by high yield and fine quality.

3616 *Deriščev, M. G.* (*Vernalization of the groundnut*). (*pp. 39–41*).
The effects of vernalization upon maturation and yield of Stepnjak [Steppe] and VNIIMK 4159 are described.

3617 *Umen, D. P.* (*Breeding sesame*). (*pp. 42–47*).
New high-yielding varieties, characterized by white seed, high oil content and resistance to *Thielaviopsis basicola*, are reported from the Institute of Oil Plants. The most recent selections, 89/50, 99/50, 336, 379 and 323, are more productive of seed and oil than Kubanec, previously regarded as the best variety, and some are as early as this; they shed their leaves before harvesting and show resistance to shattering.

3618 *Psareva, M. M.* (*The biology of flowering of the oil poppy*). (*pp. 48–51*).
The effects of different modes of pollination upon the weight of seed and the number of unfertilized ovules per capsule were investigated at Voronež. The highest value for seed weight and the lowest for unfertilized ovules were obtained when the plants were open pollinated and supplementarily fertilized by mixed pollen.

3619 *Voskresenskaja, G. S.* (*The breeding of* Camelina sativa). (*pp. 52–57*).
The new varieties 2147 and 2168 from Krasnodar yield 22–23 kg. oil more per ha. than the standard Voronež 349.

3620 *Voskresenskaja, G. S.* (*Yellow-seeded and grey-seeded forms of* Brassica juncea). (*pp. 58–65*).
Variety 351 from Alma-Ata has been improved by selection and surpasses the standard Neosypajuščajasja 2 [Indehiscent 2] in yield of seed and oil. Other high-oil types have been selected among material from central Asia, especially yellow-seeded plants which are higher in oil than the grey-seeded.

3621 *Kuganova, M. A.* (*Changing the heritable basis of spring rape by repeated sowing in autumn*). (*pp. 66–68*).
A spring form as hardy as the winter rape Nemerčanskiĭ and with seed as large as this was obtained at Krasnodar by allowing plants that arose from fallen grains of some open-pollinated spring varieties to overwinter and then sowing the second and third seed generations as winter rape.

3622 *Voskresenskaja, G. S.* (*New oil plants of the family Cruciferae*). (*pp. 69–73*).
Mention is made of trials of introduced material of *Brassica nigra*, *Raphanus sinensis* and *Crambe abyssinica* which is thought to have possible value as oil plants.

3623 *Moškin, V. A.* (*Breeding and seed growing of the castor-oil plant*). (*pp. 74–82*).
New high-yielding, early-maturing and midseason forms have been bred at Krasnodar. They are suitable for combine harvesting.

3624 *Moškin, V. A.* (*The new castor-oil plant variety VNIIMK 165*). (*pp. 83–87*).
VNIIMK 165 [Oil Plants Institute 165] was obtained by hybridization involving ssp. *sanguineus*, *manshuricus* and *persicus* of *Ricinus communis*. It outyields the standard Sanguineus 401 and has a habit suitable for combine harvesting.

3625 *Danilenko, A. A.* (*The results of breeding work on linseed*). (*pp. 88–94*).
I276 and I95, bred at the Don Research Station, outyield the standard Don 166. Forms with an oil content of up to 47·60% are under observation; they were obtained by intervarietal

hybridization involving the use of mixed pollen from plants selected for high oil content.

3626 *Danilenko, A. A.* (*The results of breeding work on* Lallemantia). (*pp. 98–105*).

Varieties bred in recent years at the Don Research Station include the productive forms L74 and L152, the latter resistant to *Alternaria*, and Vysokoroslaja 26 [Tall 26], which is suitable for combine harvesting.

3627 RADET, E.
Étude de quelques variétés de colza. (**Study of some rape varieties**).
Ann. Inst. nat. Rech. agron., Paris : Sér. A : 1955 : **6** : 770–72.

Data on yield, period to maturity, oil content and resistance to diseases, insect pests and shedding are presented for seven new varieties recently compared with the standard Alsace in trials at Châlons, France. Matador 282, Hybride 358A [Hybrid 358A], Nain de Hambourg 277A [Hamburg Dwarf 277A] and Nain de Hambourg 460 outyielded Alsace in total grain yield. Matador 282 had the highest oil content and Nain de Hambourg 277A and 460 were the most resistant to shedding.

3628 ANDERSSON, G., OLSSON, G. & LÖÖF, B.
Kombinerade sort- och kvävegödslingsförsök med höstraps. (**Combined varietal and nitrogen-fertilizer trials with winter rape**).
Sverig. Utsädesfören. Tidskr. 1956 : **66** : 39–54.

Of the three varieties Senraps [Late rape], Tenus and Matador, tested by the Swedish Seed Association over the period 1949–54, the last mentioned gave the highest yield and had the highest oil content at all levels of nitrogen. The only marked intervarietal difference in response to increased nitrogen dressing was a significant increase in the 1000-seed weight of Matador, that of the other varieties remaining unchanged.

3629 KANNO, C., KOMEMOTO, T. & GOTO, Y.
(**Studies on a pathological condition involving withering and failure to ripen in rape**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **24** : 20–26. [Japanese].

The condition is due to boron deficiency. Varieties conspicuously resistant or susceptible to boron deficiency are listed.

3630 SHIFRISS, O.
Sex instability in Ricinus.
Genetics 1956 : **41** : 265–80.

It is suggested that a gene *F* determines monecism in a genetically stable series of sexual variants in *R. communis*, ranging from female (*ff*) to strongly male inbreds. In monecious races, *F* is fully expressed at a very early stage of ontogeny. Sex expression in the stable series is however subject to considerable nongenetic fluctuation during the development of individual plants. Sex reversals occur spontaneously in many natural populations and in inbred races. They represent a genetically unstable series of females differing in the time of life at which monecism is shown and also in the behaviour of their offspring with respect to sex reversal. This phenotypic change from femaleness to monecism is developmentally irreversible. The progenies of sex reversals consist of varying proportions of sex reversals and monecious individuals. In general, early-reverted females when selfed produce less than 30% of reversals, mostly early in life, whereas late-reverted females when selfed give rise to over 90% females, mostly undergoing late reversal. By selection for early or late reversal any unstable selfed stock can be converted into a line with a high or low rate of sex reversal. Once selection is relaxed, a rapid regression towards stable monecism occurs in subsequent generations. The behaviour of sex reversals is explained by postulating that an unstable nuclear factor causes suppression of the action of *F* and that this factor undergoes reversible mutation into suppressors with various degrees of stability and suppression. Phenotypic reversal occurs as the result of the release of *F* from suppression, its time depending upon the "dose of the suppressor, the potential sex tendency of *F* and nongenetic variations". The higher the degree of suppression of *F*, the less marked is the effect of environmental conditions upon the incidence of sex reversal.

3631 PETERSON, A. S.
Castor bean research in New South Wales.
Agric. Gaz. NSW 1956 : **47** : 29–33, 144–47.

The investigations described include testing of introduced varieties and hybridization at the Yanco Experiment Farm. Varieties introduced from the USA and other countries have been tested under conditions of irrigation and mechanical harvesting by standard wheat machinery since 1948. Kirripi Wild, Mauthner's Dwarf and US4 have shown most promise but each has defects. Introduction of varieties from the USA is continuing in the hope of finding more suitable forms. In addition, crosses have been effected with the ultimate aim of developing a variety possessing the high oil content of US4, the tough nonshattering capsules of Kirripi Wild and the thin stem and early maturity of Mauthner's Dwarf.

3632 ALABOUVETTE, L. & RAUTOU, S.
Le ricin dans la région méridionale. (**The castor-oil plant in the southern region**).
CR Acad. Agric. Fr. 1956 : **42** : 159–68.

The possibility of a more extensive cultivation of the castor-oil plant in southern France is discussed. Trials of a number of introductions from abroad, mainly from the USA, at the Montpellier Plant Breeding Station in 1954 showed that they outyielded the local early-maturing variety Anjou by a considerable margin. Tabulated data are presented on the seed yields, oil content of the seeds and yield of oil per ha. by these introductions. Cimmaron gave the highest yields of oil per ha., followed by Conner; the latter variety had the highest oil content. In further trials in 1955 the above varieties were compared with four American hybrids, viz. Baker 195 hybrid, Hybrid 4, Hybrid 7 and Cimmaron hybrid. The two latter hybrids gave yields well in excess of those of Cimmaron and Conner and were also more resistant to lodging and *Alternaria ricini.* Hybrid 7, however, proved susceptible to shedding.

3633 **Will release new Renner improved sesame strain.**
Sth. Seedsman 1956 : **19** : No. 1 : 48–49.

Renner 2, which is being released by the Texas Research Foundation, is earlier, more vigorous and more tolerant of drought than Renner 1 and has large, mild-flavoured seeds.

3634 ARZUMANOVA, A. M.
(**Utilizing foreign pollen in hybridization**).
Agrobiologija (Agrobiology) 1956 : No. 1 : 52–61. [Russian].

Breeding work on sesame involving the use of pollen of *Hibiscus syriacus* and *Antirrhinum majus* is reported from Leningrad and heritable changes with regard to economical and morphological characters obtained in the material derived from the varieties Taškent 122 and Konditerskiĭ 2058 [Confectionery 2058] are described. Each variety was pollinated by the pollen of *H. syriacus*, by *A. majus*, by pollen taken from other plants of the same variety + *H. syriacus* or *A. majus*, and by pollen of the other variety + *H. syriacus* or *A. majus*. The pollinations by foreign pollen + self pollen were carried out simultaneously or at an interval of 20 minutes in either order. Forms distinguished by high yield, early maturity and vigour have been selected, among them some derivatives of Konditerskiĭ 2058 showing improved resistance to *Fusarium*. The material selected from Taškent 122 x *H. syriacus* + self pollen includes a new form which has the capsules arranged in threes. It is characterized by indehiscent bolls and greater earliness than Taškent 122. Two other forms selected among the same progeny shed their leaves before reaching maturity.

3635 CHAUDHURI, K. L. & DAS, A.
Effects of X-rays on the fertility of pollen grain in *Sesamum orientale* Linn.
Sci. & Cult. 1956 : **21** : 550–53.

In investigations at the Bose Institute, Calcutta, the percentage of pollen sterility in plants raised from X-irradiated seeds increased with the dosage only up to 40,000 r. but decreased with higher dosages in two varieties. In a third variety the percentage of pollen sterility increased with the dosage throughout the range of treatment (14,400–80,000 r.). It is suggested that in some cases physicochemical changes in the irradiated embryo may partly counteract the effects of high dosages so that chromosome breakage or other events responsible for the pollen sterility are minimized.

3636 **A note on the occurrence of the "phyllody" disease in certain sesame (*Sesamum orientale* L) types and their behaviour.**
Madras agric. J. 1956 : **43** : 114–16.

Varietal differences in susceptibility to the virus disease phyllody have been observed at the Agricultural Research Station, Tindivanam, Madras. Entebbe Uganda has shown a high degree of resistance. Hybridization has been undertaken to determine whether reaction to phyllody is genetically determined.

3637 Forsøg med Sorter af Oliehør 1953–55. (**Trials of varieties of linseed, 1953-55**).
Tidsskr. Frøavl. 1956 : No. 526 : 385–86.

Tables and notes are provided on the results of preliminary trials of five varieties at four stations in Denmark. Øtofte L.47 has given the highest yield of both seed and crude oil, crude protein and straw.

3638 ŠIMANSKIĬ, N. K.
(**Intervarietal and intravarietal hybridization of linseed**).
Agrobiologija (Agrobiology) 1956 : No. 2 : 114–18. [Russian].

At the USSR Institute of Breeding and Genetics, Odessa, the productiveness, 1000-seed weight, oil content and oil quality of the varieties Voronež 1308, DSS166 and DSS48 were improved by (*a*) intervarietal open pollination and (*b*) artificial hybridization involving the use of pollen mixtures. In the case of each seed parent, the pollen was supplied by the other two varieties + Krupnosemjannyĭ 3 [Large-seeded 3], Kubanj 9 and VNIIMK 5288 [Oil Plants Institute 5288]. The third seed generation comprised 94–98% plants characteristic of the initial variety. A number of forms high in oil and outyielding the standard Voronež 1308 were selected among the above material. The best among them, VSGI89 [USSR Breeding and Genetics Institute 89], produces 14·3 c. seed per ha. and has an oil content of 45·32% as against 13·4 c. per ha. and 44·00% in Voronež 1308.

3639 **(A new sunflower variety).**
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 3 : p. 32. [Russian].

Don 695, from the Oil Plants Institute, has an oil content of 44·7% and produces 126 kg. more oil per ha. than VNIIMK 8931 [Oil Plants Institute 8931].

3640 Pustovoĭt, V. S.
(Breeding and seed growing of sunflower).
Agrobiologija (Agrobiology) 1956 : No. 1 : 9–17. [Russian].

An account of breeding work at the Oil Plants Institute in Krasnodar and its branches is presented. A number of *Orobanche*-resistant varieties with an oil content of up to 50·95% have been developed. The best yield upwards of 10 c. oil per ha. All, except VNIIMK 13485 [Oil Plants Institute 13485] and VNIIMK 13373, the newly bred forms from Krasnodar, are older varieties whose oil contents have been improved by selection. K1483, together with several others, is characterized by a short growth period. Rust-resistant forms were obtained by crossing *Helianthus ruderalis* with varieties 1640, 6540 and 8931 of *H. annuus*. The use of interspecific hybridization for improvement of resistance to shedding is mentioned, as is also the use of vegetative and sexual hybridization involving *H. tuberosus* and *H. annuus* for the development of new forms. Several combinations of varieties are recommended for the production of hybrid seed, as they give high-yielding progenies from both direct and reciprocal crosses and can be allowed to interpollinate in the field.

3641 Schuster, W.
Untersuchungen über die Wirkung der 2,4-Dichlorophenoxyessigsäure (2,4-D) und α-Naphthylessigsäure (NES) auf die Blüte und den Samen der Sonnenblume sowie die Nachwirkungen in den folgenden Generationen. [**Investigations on the effect of 2,4-dichlorphenoxyacetic acid (2,4-D) and α-naphthylacetic acid (NES) on the flower and the seeds of the sunflower and on the after-effects in subsequent generations**].
Züchter 1956 : **26** : 78–83.

Experiments were carried out to ascertain whether spraying the foliage and buds of the sunflower with various concentrations of β-indolylacetic acid, 2,4-dichlorphenoxyacetic acid and α-naphthylacetic acid (cf. *PBA*, XX, Abst. 1961) was an effective method of inhibiting the development of the male flower and so facilitating the production of F_1 hybrid seed (cf. Abst. 1634). Treatment with β-indolylacetic acid had no effect upon flowering; the other two substances tested led to pronounced stunting and deformation of the foliage and flowers and, in some cases, to a reduction in the amount of pollen produced. Many of the seeds from these flowers were nonviable and almost all were considerably smaller than normal seeds. It is concluded that none of the three hormones provides a satisfactory method of producing F_1 hybrid seed. Many of the plants grown from seeds of sunflowers treated with 2,4-dichlorphenoxyacetic acid or α-naphthylacetic acid solutions displayed pronounced foliar and floral aberrations; no conclusions were drawn as to whether these aberrations were the result of mutation or were due to the transference of the hormones in question through the seeds to the following generation. It was, however, noted that sunflower lines that had been inbred for a number of generations without being subjected to hormone treatment manifested similar abnormalities, due possibly to an accumulation of plant hormones in these inbred lines.

3642 Jackson, R. C.
Natural hybridization in perennial sunflowers centered about *Helianthus mollis*.
Diss. Abstr. 1955 : **15** : Publ. No. 14,406 : p. 2393.

H. mollis has been found to hybridize naturally with *H. divaricatus*, *H. occidentalis*, *H. grosseserratus* and *H. giganteus*. Introgression has occurred in the species studied. Artificial hybrids were obtained between *H. mollis* on the one hand and *H. atrorubens*, *H. occidentalis*, *H. grosseserratus* and *H. giganteus* on the other. No artificial hybrids of *H. mollis* x *H. divaricatus* were secured. The chromosomes of the parental species are still fairly homologous, although some structural differentiation has occurred. Both internal and external factors have kept *Helianthus* spp. isolated in the past but probably these barriers are no longer so effective as the result of the influence of man upon the environment. It is concluded that speciation in the genus has resulted in numerous morphologically distinct but genetically closely related taxa.

3643 Trepačev, E. P.
(Sunflower varieties high in oil).
Agrobiologija (Agrobiology) 1956 : No. 2 : 28–33. [Russian].

The results of chemical analyses of the seed and of the physical and chemical properties of the oil of a number of sunflower varieties are discussed in relation to breeding for high oil content. Data showing the oil and husk contents of the new varieties Zelenka 368, VNIIMK 8931 [Oil Plants Institute 8931] and Armavir 3497 and also of older varieties which they supersede as standards in certain districts are provided. The new varieties are all characterized by an improved oil and reduced husk content.

3644 Heiser, C. B.
Biosystematics of *Helianthus debilis*.
Madroño, S. Francisco 1956 : **13** : 145–67.

An account of intraspecific variation in *H. debilis* is given. Nine morphological races are distinguished and these fall into two groups in respect of ease of crossing. Reduced intraracial fertility is associated with defective chromosome pairing. The affinities of the races as manifested by ease of crossing do not coincide with the morphological relationships. *H. debilis* is difficult to distinguish precisely from *H. petiolaris*.

3645 Swanson, A. F. & Rojas, E.
Sunflowers in Peru.
Spec. Rep. Prog. Coop. Exp. Agropec., Lima 1956 : No. 5 : Pp. 9. (Mimeographed).

The history of sunflower cultivation and breeding in Peru is surveyed, particular reference being made to the cooperative development of rust-resistant varieties at the La Molina Agricultural Research Station in Peru and the Morden Experimental Farm in Canada (cf. Absts. 1636–7). Breeding aims include the production of rust-resistant types for forage and green silage, particularly in the Rimac Valley, and of forage and oil-crop types adapted to the highlands.

3646 Ždanov, L. A.
(Breeding the sunflower for resistance to *Orobanche* and rust).
Dokl. Akad. seljskohozaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 2 : 14–19. [Russian].

Forms of cultivated sunflower, with good economic properties, were obtained by interspecific hybridization involving *Helianthus ruderalis* at the Don Research Station. They are all superior to VNIIMK 6540 [Oil Plants Institute 6540] in resistance to rust and some show improved resistance to *Orobanche*. The best hybrids yield up to 140 kg. more oil per ha. However they are characterized by a long growth period, an unwanted character which it is hoped to overcome by crossing with early varieties. Mention is also made of other rust-resistant interspecific hybrids and vegetative-sexual hybrids of *H. tuberosus* bred at Krasnodar, notably hybrids G 1219, 14902 and 14905. G 1219 outyields the standard VNIIMK 1646 and the others produce more seed and oil per ha. than VNIIMK 8931, a variety notable for its high oil yield.

3647 Ždanov, L. A.
(The principal results and resources of further progress in sunflower cultivation).
Zemledelie (Agriculture) 1956 : No. 2 : 18–23. [Russian].

Mention is made of recent selections from the Oil Plants Institute, Rostov, Armavir, Veĭdelevka and other breeding stations. Most are distinguished by high yield and resistance to *Orobanche* and some, for instance VNIIMK 8931 [Oil Plants Institute 8931], Veĭdelevka 368 and Armavir 3497, have an oil content of up to 47%. VNIIMK 8883, Don 695, Armavir 9343 and Černjanka Veĭdelevskaja 76 [Black Veĭdelevka 76] are mentioned among the most recent achievements. They are midseason varieties, characterized by *Orobanche* resistance and high oil contents.

3648 Pronk, F.
De veredeling van de oliepalm door het algemeen Proefstation der A.V.R.O.S.
(Oil-palm breeding by the AVROS General Experimental Station).
Bergcultures 1956 : **25** : 119–31, 139–53.

An historical survey of breeding work on the oil palm in Sumatra is given. Three main categories are distinguished, viz. (1) Deli dura palms, all of which are descended from four palms introduced into the island in 1848; (2) Import palms, which were introduced later and comprise *dura*, *pisifera* and *tenera* types; and (3)

Import dura, which are derived from crosses between (1) and (2). Recent research at the Karang Inoué and Aek Pantjur stations has shown that bunch number and bunch weight are inherited independently; the average bunch weight of Import palms (*dura* and *tenera*) was lower than that of Deli dura palms but the former group produced a higher number of bunches. In crosses between Deli dura and Import tenera the bunch weight of Deli dura proved dominant. In general hybrids between *dura* and *tenera* types and between *dura* and *pisifera* types tended to produce the same number of bunches as Deli dura palms but, owing to their larger bunches and the thicker flesh of the fruits, up to 25% more oil (cf. Abst. 1640). Selection for increased number of bunches in the hybrids is being undertaken.

3649 Sparnaaij, L. D.
Seedling selection in oil palm nurseries.
J. W. Afr. Inst. Oil Palm Res. 1955 : No. 3 : 51–63.

The method of seedling selection proposed by Devuyst (cf. *PBA*, XXIV, Absts. 1373 and 3247) is examined from the theoretical aspect and also in the light of experimental data obtained at the West African Institute for Oil Palm Research, Nigeria. In view of the following conclusions from these data, it is considered that the value of Devuyst's method is not yet established: (1) variations in leaf production in the nursery, even under the most uniform conditions, are mainly due to nongenetical factors; (2) correlation between leaf number and seedling height at planting time is low; (3) transplanting reduces or even reverses differences evident at the time of planting; (4) lasting differences in the leaf production of palms during the years before flowering are attributable to differences in soil fertility rather than to genetical disparities; (5) the high correlation detected between leaf number before flowering and bunch yield during the first two years of production can be explained as due to the precocity of palms producing the greater number of leaves; and (6) leaf production before flowering and bunch yield in later years show very little correlation.

3650 Toovey, F. W. & Broekmans, A. F. M.
The Deli palm in West Africa.
J. W. Afr. Inst. Oil Palm Res. 1955 : No. 3 : 9–50.

A discussion of the origin of the Deli palm is followed by a description of the physiological and morphological characters distinguishing it from African palms and a survey of information on its performance in experimental and commercial plantings in West Africa. In no locality has the Deli palm given the very high yields of which it is capable in the Far East. A detailed account is provided of the trial of Deli crosses from Malaya and locally bred strains at the West African Institute for Oil Palm Research, Nigeria. The general superiority of the local material in bunch yield shown in the first eight years of the trial, established in 1941, appears to be on the increase but possibly the Deli crosses have a slight advantage over the local strains in fruit and bunch composition (cf. Abst. 615). The yields of the parental Deli palms have displayed an inverse relationship with those of their progenies, the best trees in Malaya giving the progeny with the poorest yields in Nigeria. One of the Deli crosses, 19 x 65, is however at least equal in bunch production to the highest yielding Nigerian *dura* palm 551·256. The fruit and bunch composition of these two leading strains is being investigated to gain information for breeding purposes (cf. Abst. 2735). Although the Deli palm is on the whole not well-adapted in West Africa, some acclimatized strains, notably 19 x 65, may be useful as parents. Special characteristics of the Deli type, such as disease resistance and dwarf habit, may also prove useful in breeding. The production of *tenera* palms from Deli x *pisifera* crosses is expected to give the most valuable results.

3651 Nova espécie de *Orbignya*, produtora do óleo de babaçú. (**A new species of *Orbignya* producing babaçú oil**).
Arch. Jard. bot. Rio de J. 1953–54 (1954) : **13** : 57–59.

The species in question, found in the state of Maranhão in Brazil, is classified as *O. teixeirana*. It is thought to be a hybrid of *O. speciosa* and *O. eichleri*.

3652 Wakabayashi, S.
(**On the chromosomes of *Amorphophallus konjac***).
Senshokutai (Chromosome)/Kromosomo 1955 : No. 25–26 : 881–85. [Japanese].

Meiosis is regular. The caryotype is $2n = 26 = 2^{t}A^{m} + 2^{cs}B^{m} + 2C^{sm} + 2D^{m} + 2^{t}E^{sm} + 2F^{sm} + 2G^{st} + 2H^{m} + 2^{t}I^{sm} + 2J^{sm} + 2^{c}K^{st} + 2^{c}L^{st} + 2^{tc}M^{st}$.

3653 Mehra, P. N. & Sobti, S. N.
Cytology of Indian medicinal plants. I. The solanaceous drugs.
Bull. bot. Soc. Beng. 1954 : **8** : 221–27.

The following chromosome numbers are reported: in *Atropa belladonna*, *A. acuminata*, a natural F_1 hybrid between the two and a sport of *A. belladonna*, $n = 36$; in *Hyoscyamus niger* and *H. pusillus*, $n = 34$; in *H. muticus*, $n = 28$; and in *Physochlaina praealta*, $2n = 82$. The complete fertility and normal meiosis of the *Atropa* hybrid suggest that *A. acuminata* should be regarded as a variety of *A. belladonna* and not as a distinct species.

3654 Khoshoo, T. N.
Cytology of *Gloriosa*.
Curr. Sci. 1956 : **25** : 165–66.

Diploid collections ($2n = 22$) assigned to *G. simplex* and *G. superba* showed normal meiosis. This genus resembles *Colchicum* in containing colchicine-producing species but differs from it in possessing polyploid representatives ($2n = 44, 66, 88$). These polyploids show meiotic irregularities which result in almost complete sterility.

3655 Campaignolle, J.
Préconisations de matériel de plantation pour 1955/56. (**Recommended planting material for 1955-56).**
Comm. Pl. Indo. 1955 : No. **14** : 5–16.

Rubber clones and seedling families at present recommended for cultivation in Indo-China are described in detail together with notes on the quality of their latex. The best results in large-scale plantings were obtained from PR107, which also possesses good resistance to drought. It is slightly susceptible to *Oidium heveae* and *Phytophthora palmivora*, but not to such an extent as to cause a significant reduction in vigour or yield. The phosphorus content of the latex tends to be high, especially on red soils, and this sometimes leads to precoagulation. PB86 gives high yields of good-quality latex and reacts well with increased yields to hormone treatment. AVROS427 gives outstandingly high yields in the first 2–3 years of production but falls off later; the quality of its latex is good. Of the seedling families described, AVROS163 x Waring 4, BD2 x AVROS50, OY1 x Tjir 1 and Dj1 x Tjir 1 give the best all-round results. A number of illegitimate seedling families with Tjir 1 as the ♀ parent also show promise. The IRCI clones 2, 3, 5, 6 and 7 have given good results in provisional trials.

3656 Paardekooper, E. C.
Results of Hevea clone trials planted in 1926-1940 in the experiment gardens Tjiomas and Peweja.
Arch. Rubb. Cult. 1956 : **33** : 1–59.

Numerous statistical tables are provided summarizing the results of trials of material planted in 1926–40 at the above experimental gardens in western Java. Clones Tjir 1, PR107, LCB1320, GTi, WR10 and AV255 are recommended for planting on a large scale and the new secondary clones AV385, PR226, PR228 and PR321 for planting on a limited scale. Clone AV352 gave outstandingly high yields but had to be discarded because of its extreme susceptibility to damage by wind.

3657 Paardekooper, E. C.
Results of the testing of Hevea seedlings obtained by hand pollination during 1927-1944.
Arch. Rubb. Cult. 1956 : **33** : 61–139.

Seedlings belonging to more than 70 families were tested in 12 trials at three centres in western Java. Of the 20 clones used as parents, Tjir 1, PR107 and LCB1320 gave progenies with the highest yields and families with Tjir 16, BD5 and BR2 as one of the parents gave the lowest yields. Some seedling families with PR107 as one parent were highly resistant to wind damage, brown bast and diseases of the tapping panel but Tjir 1 seedlings tended to be highly susceptible to brown bast and wind damage. In general, the yield potential and colour and quality of the latex of the parent clones were transmitted to the progenies but, in selfed material, some depression due to inbreeding was observed.

3658 Paardekooper, E. C.
Further data on early selection in Hevea.
Arch. Rubb. Cult. 1956 : **33** : 159–94.

Experiments at the Bogor Central Experimental Station, Indonesia, on the effectiveness of the prick test method (cf. *PBA*, XXIII, Abst. 2144) as a means of predicting the future yield potential of 1–2 year old seedlings are discussed. In some seedling families, such as PB186 x Tjir 1, Tjir 1 x BR2, Tjir 1 x AV163, Tjir 1 x G11, Tjir 1 x War 1 and its reciprocal and Tjir 1 x BD5 and its reciprocal the result of the prick test method showed a high correlation with yields later obtained from the same trees when they had matured. On the other hand, families which had PR107 or AV107 as one of their parents tended to give low values in the prick test despite their frequently high yields when the trees were mature. In general a high prick test value was a reliable indication of high yields in the mature tree but the reverse did not always hold true as families with a low prick value sometimes gave high yields later. For reliable early selection of *Hevea* seedlings in the field it is suggested that a combination of the prick test method with measurements of height and girth and sample tappings is necessary.

3659 Schultes, R. E.
The Amazon Indian and evolution in *Hevea* and related genera.
J. Arnold Arbor. 1956 : **37** : 123–52.

The author examines the literature on use of the seeds of *Hevea*, *Micrandra* and *Vaupesia* spp. by the Indians in the north-western part of the Amazon Basin and describes his own relevant observations. He concludes that recently suggested hypotheses, in which domestication as a food plant is said to have played a decisive role in the evolution of *Hevea*, are not factually supported. The Indians use seeds from wild trees and are not in the habit of making plantings near their temporary dwelling sites. Since the seeds of *Hevea* are short-lived, it is moreover unlikely that the ranges of the different species have been extended by Indians who took seeds with them when migrating.

3660 Brookson, C. W.
Importation and development of new strains of *Hevea brasiliensis* by the Rubber Research Institute of Malaya.
J. Rubb. Res. Inst. Malaya 1956 : **14** : No. 298 : 423–47.

A detailed account is provided of the introduction of *Dothidella* resistant clones of *H. brasiliensis* and of seedlings of this species, *H. guianensis*, *H. benthamiana*, *H. spruceana*, *H. pauciflora* and hybrids into Malaya from Brazil, in exchange for RRI clones and selections of rice and oil palm (cf. *PBA*, XXVI, Abst. 623). The proposed programme for immediate use of the clones to introduce resistance to *Dothidella* into the rubber of the Far East and the steps taken to test the seedling introductions, as clones, with respect to yield, habit and other characters are also described. Budded material of both the clones and seedlings from Brazil has been supplied to colleagues in Ceylon and other countries.

FRUITS AND NUTS

3661 Constantinescu, N., Sonea, V., Bordeianu, T.& Ioniță, C.
Regiunile pomicole din R.P.R. cu premisele pentru dezvoltarea în perspectivă a pomiculturii. (**Fruit-growing regions in the Rumanian People's Republic and the premises for prospective development for the fruit growers**).
Trat. Monogr. Inst. Cerc. agron. 1955 : No. 2 : Pp. 112.

This survey of the potentialities of more intensive fruit growing in Rumania includes lists of Rumanian and introduced varieties of apple, pear, quince, plum, apricot, peach, sweet and sour cherry, gooseberry, currants, raspberry and strawberry grown in the various horticultural regions recognized.

3662 Brooks, R. M. & Olmo, H. P.
Register of new fruit and nut varieties list 10.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 445–54.

A further descriptive list of varieties of fruits and nuts recently introduced in the USA is given (cf. Abst. 626).

3663 Monroe, R. J. & Mason, D. D.
Problems of experimental inference with special reference to multiple location experiments and experiments with perennial crops.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 410–14.

A short discussion of the application of analysis of variance to experiments replicated at various locations and extending over several seasons is presented.

Annual Report of the East Malling Research Station, near Maidstone, Kent, 1st October, 1954 to 30th September, 1955 (1956) : Pp. 162.

3664 *Rogers, W. S. Pomology. (pp. 23–30).*
Pome fruits. The pear/quince hybrid, *Pyronia veitchii* var. *luxemburgiana* has been subjected to hybridization with a view to obtaining rootstocks combining compatibility with all pear scion varieties with good nursery performance; several fruits have set after pollination with apple.

Numerous seedlings from crosses between Cox's Orange Pippin and several very late-flowering apple varieties from the continent have been established. Work on breeding and selecting apple scions of good fruit quality highly resistant to woolly aphid continued and hybrids between Northern Spy, Cox's Orange and Crawley Beauty are under test. Further crosses between Northern Spy, Court Pendu Plat and Irish Peach have been effected. Six new apples with very early-maturing fruits and seven pears which appear to combine good fruit quality with heavy and regular cropping have been selected for further trial.

The sport of MXIII described in *PBA*, XXV, Abst. 471 is a chimera with a diploid epidermis surrounding a tetraploid core.

Prunus. With the object of producing dwarfing rootstocks for cherries, selected mazzards have been crossed with *P. canescens*, *P. pseudocerasus*, *P. pumila*, *P. spontanea*, *P. tomentosa*, *P. japonica* var. *nakaii* and *P. wadai*.

Raspberry. Two promising plants have been obtained from Boysenberry x Exploit and are to be propagated and back-crossed to the red raspberry parent. Lloyd George x *Rubus palmatus* back-crossed to Lloyd George has yielded four vigorous plants. F_1 plants of Lloyd George x *R. palmatus* have been treated with colchicine. An investigation into the inheritance of resistance to *Amphorophora rubi* has been initiated.

3665 *Harris, R. V. Plant pathology. (pp. 37–43).*

Anatomical and physiological studies of hops suggest that wilt tolerance is in part the result of the action of the following mechanisms: modifications of the cell wall in root tissues, tending to restrict entry of the pathogen into the vascular cylinder; formation of tyloses in the vessels, probably reducing both fungal development and water transport; and increased secondary wood production, permitting maintenance of water transport. Of 54 varieties tested, 44 were equal or superior to OR55 in wilt tolerance.

3666 *Massee, A. M. Entomology. (pp. 44–46).*

Seedlings from open-pollinated trees of Northern Spy x Laxton's Superb and Northern Spy x Ben Nevis have continued to show resistance to woolly aphid. Six seedlings of Cox's Orange Pippin x Northern Spy have also proved resistant.

3667 *Freeman, G. H. The selection and use of a panel for taste sensitivity tests with fruit. (pp. 86–88).*

The selection and operation of a panel of six to ten members for tasting and describing fruit flavours is described.

3668 **Progress Report of the Horticulture Division, Central Experimental Farm, Ottawa 1949-53** : Pp. 205.

This report carries on from the previous one which covered the period 1934–48 (cf. *PBA*, XXI, Abst. 881).

Apple. Information is given on the value of several varieties as parents in breeding for different characters (cf. Abst. 637).

In breeding for resistance to scab (*Venturia inaequalis*), Geneva (*Malus pumila* var. *niedzwetzkyana*, open-pollinated), R12740–7A (*M. pumila*), Jonathan x (Rome Beauty x *M. floribunda*), Wolf River x *M. atrosanguinea*, Wolf River x *M. prunifolia*, Wealthy x *M. prunifolia* and Wolf River x *M. micromalus* have been used as sources of resistance. Many highly resistant seedlings are now being subjected to fruiting tests.

Vigorous triploids have been obtained from crosses of diploids with colchicine-induced tetraploids. Use as parents is being made of 4*n* *M. baccata* seedlings.

Several promising seedlings ripening earlier than Melba are under test in Quebec and Ontario. Except for O–292 (Melba x Astrachan), they originated from Melba x Crimson Beauty. A red sport of Melba and another of Crimson Beauty are also under trial. Midseason and late-maturing selections undergoing test comprise a red sport of Atlas, Bancroft (cf. *PBA*, XXII, Abst. 997), Toshkee and O–2016 (McIntosh x Milwaukee).

Somatic chromosome numbers were determined in 53 varieties, all of which proved to be diploids, with the exception of Hibernal and Withington Fillbasket, found to be triploids. Hibernal has been reported to be 4*n* or 3*n* by other investigators.

Seedlings from crosses made at Ottawa have been selected at the Dominion Horticultural Substation, Smithfield, Ont., and are to undergo commercial test. Cortland, Cox's Orange Pippin, Crimson Beauty, Delicious, Hume, Jonathan, Lawfam, Linda, Lobo, McIntosh, Melba, Milton and Sandow are involved in the parentages.

Pear. The following seedlings are undergoing extensive test: O–291 and O–292, both from Winter Nelis x Bartlett; O–301 (Menic x Winter Nelis); and 0361 (Miney x Phileson). Crosses involving the hardy variety Karl Sabioski, Bartlett and high-quality O–291 were effected in 1950.

Plum. Seedlings of *Prunus domestica* have been obtained from crosses of hardy with good-quality varieties. Within *P. salicina*, large-fruited, good-quality varieties have been crossed with hardy seedlings. Seedlings from either set of crosses have not yet come into bearing.

Cherry. Hexaploids have been obtained by treating germinating after-ripened seeds of triploids from crosses between 4*n* sour and 2*n* sweet cherries with colchicine.

Rubus. Three seedlings have been named: Muskoka [O–201 (Newman 23 x Herbert)], Tweed [O–263 (Newman 23 x Lloyd George)] and Thames [O–277 (Lloyd George x Newman 23)] (cf. *PBA*, XXI, Abst. 881). The first two are outstanding with respect to hardiness; the last-mentioned is very late maturing. Four numbered seedlings have been introduced: O–381 [(Lloyd George x Newman 23) x Viking];

O–382 (Ottawa x Rideau); O–383 (Ottawa x Madawaska); and O–384 from [(Royal Purple x Newman 23) x Viking] x Trent.

Inbreeding of Ottawa varieties has been undertaken to eliminate undesirable genes. If propagated by seed, seedlings more homozygous than the standard varieties may be of value in eliminating the virus problem.

In hybridization between Ottawa varieties, Gatineau x Ottawa, Rideau x Muskoka and Muskoka x Trent have produced the most valuable progenies. Ottawa, however, transmits its susceptibility to mildew (*Sphaerotheca humuli*) to many of its seedlings. Madawaska x Milton has proved to be the most useful combination with respect to resistance to this fungus, with 68·8% of the seedlings without infection.

Breeding has been initiated to develop a cultivated variety of *R. chamaemorus*.

Black currant. The varieties Crusader and Coronet, resistant to rust (*Cronartium ribicola*), gave disappointing results (cf. *PBA*, XX, Abst. 1270). After their introduction, it was discovered that they are almost entirely self sterile and require cross pollination. The rust-resistant self-fruitful variety Consort (Kerry x *Ribes ussuriense*) was introduced in 1951 to replace Crusader and Coronet. It is immune from rust but susceptible to mildew (*Sphaerotheca mors-uvae*). A Polish seedling (*R. nigrum*) resistant to mildew has been crossed with rust-resistant varieties in an attempt to combine resistance to both diseases.

Data from back crosses of Crusader x Kerry, Crusader x Magnet and Coronet x Magnus, but not from Coronet x Kerry, confirmed that resistance to *Cronartium ribicola* depends upon a single dominant gene.

Gooseberry. Captivator (cf. *PBA*, XXI, Abst. 1686), O–271, O–273, O–274 and O–275, all of Spinefree x Clark parentage, have undergone commercial trial. Although not entirely satisfactory in some respects, these varieties have the advantage of thornlessness.

Blueberry. F_1 plants from highbush x native lowbush combinations were intermediate between the parents in size of plant and fruit. The F_2 shows a much greater range of variation. Open-pollinated progenies of Kengrape, Jersey and Stanley have included a large proportion of vigorous plants with high-quality fruit.

Amelanchier. Large-fruited seedlings of *A. alnifolia* have been selected. Tetraploids have been induced by colchicine in the hope of securing a further increase in fruit size.

Elder. Large-fruited early seedlings of Adams have been developed. Crossing between *Sambucus canadensis* and the earlier ripening but inedible red elder, *S. racemosa*, has been attempted.

Strawberry. The following selections were distributed for trial under commercial conditions: O–481 (Valentine x Sparkle); O–482 (Fairfax x Valentine); O–483 (Valentine x Fairfax); O–484 (Claribel x Sparkle); O–485, O–486 and O–487, from Sparkle x Valentine; and O–491 and O–492, from Maytime x Valentine.

The combination Sparkle x Valentine has given outstandingly good selections. Premier x Fairfax, Premier x Valentine and Valentine x Fairfax have yielded early-ripening seedlings. Claribel x Sparkle is a valuable combination with respect to berry firmness and appearance. A high proportion of early and medium-early seedlings with good commercial characters has been obtained from Premier x Temple; many of these seedlings have remained free from all foliage diseases. Seedlings with mid-season to late maturity, good yielding ability and very little spot but some scorch have been secured from Temple and Dresden. Fairfax and Premier are superior to Sparkle as parents in producing seedlings resistant to leaf spot (*Mycosphaerella fragariae*).

Inbred lines of Premier, Sparkle and Fairfax are being developed.

Cranberry. Two native selections from Nova Scotia are to be further tested. One is earlier than Early Black, with a more attractive berry; the other is later than Howes. Crosses have been made between these selections and between the early selection and Early Black.

Radish. The colchicine-induced tetraploid of Scarlet Globe is at the final stage of testing. It appears however to offer little advantage over the $2n$ variety.

Onion. Male sterility is being transferred from Early Yellow Globe 2129A to standard varieties. It is expected that the transference will entail 8 back crosses, each requiring 2 years for completion. The discovery of an *S ms ms* plant in Red Wethersfield has rendered the lengthy back crossing unnecessary in the case of this variety. Intervarietal crosses are in the meantime being studied to obtain information on combining ability.

Asparagus. Colchicine-induced tetraploids are to be tested.

With the exception of one $2n$–$4n$ pair and one haploid pair, twin seedlings in Eden were diploid.

Cabbage. Until recently, improvement was restricted to selection of existing varieties. This has resulted in Canadian Acre (cf. *PBA*, XXI, Abst. 1686) and, not yet introduced, Ottawa CA–1, a late selection of Rossebo. Breeding for resistance to clubroot has been initiated, using Canadian Acre as recurrent parent and cabbage-kale hybrids from Wisconsin University as sources of resistance.

Spinach. Compared with the parental and other $2n$ varieties, tetraploids of Long Standing Bloomsdale developed by means of the colchicine technique are smaller and more variable, with thicker but smaller leaves.

Cucumber. Breeding was initiated in 1952 to develop an early, high-quality variety resistant to mosaic and bacterial wilt (*Erwinia tracheiphila*). Bacterial-wilt resistant selections, of possible value for breeding, have been obtained from AODAI 1, PI200816, PI196477, PI200817, PI197085 and RW255.246–2–4.

Tomato. Male sterility (*sl*) due to vestigial development of the stamens (cf. *PBA*, XXV, Abst. 608) offers a more promising type of sterility to facilitate production of F_1 hybrid seed than the positional type (*ps*) with adherent corolla and nondehiscent anthers.

Of the F_1 hybrids tested, Meteor x Urbana, Urbana x Ottawa TO–17, Dixville x Meteor, C855NC4 x Puck and Carleton x Churchill have shown most promise.

Carleton (Abel x Marglobe) is the most recent introduction resulting from breeding nonhybrid varieties for use in domestic and market gardens (cf. *PBA*, XXII, Abst. 997).

Ottawa TO–17 (Bounty x Early Rutgers), Ottawa TO–23 (Early Rutgers x North Dakota 38) and Ottawa TO–24 (Ottawa TO–10 x Ottawa TO–4) show promise for processing.

Two types of resistance to *Phytophthora infestans* have been recognized: an intermediate reaction, first noted in selections from the Philippines, and resistance due to hypersensitivity, as in some lines of *Lycopersicon esculentum* var. *cerasiforme*. Greenhouse inoculations under controlled conditions have given a more reliable indication of resistance than field tests. Data concerning inheritance of reactions to the fungus have so far been inconclusive. In addition to the common race (race 1), two other races, 2 and 3, have been identified.

Egg plant. A recessive monofactorial type of male sterility, due to indehiscence of the anthers, has been found in Blackie; it may prove useful in the commercial production of F_1 hybrid seed (cf. Abst. 776).

Several male-sterile lines have been crossed with commercial varieties to evaluate combining ability.

Bean. No useful degree of resistance to *Pseudomonas phaseolicola* or *Xanthomonas phaseoli* was found among a wide range of varieties. Emerson 51, a Tendergreen type, was used as the source of resistance to anthracnose (*Colletotrichum lindemuthianum*) in crosses with Topcrop and other varieties; selection of the hybrids resulted in a rapid trend towards resistance, 80% of the F_5 being resistant to α, β and γ anthracnose.

Crosses involving such varieties as Round Pod Kidney Wax, Giant Stringless Green and Sensation Refugee 1066 have given promising lines, shortly to be included in yield trials. Selections of Giant Stringless Green Pod x Sensation Refugee 1066 are early maturing and suitable for mechanical harvesting. New Abundance was crossed with Contender and Topcrop to combine the character of spike-like inflorescence (*ram*) of the first-mentioned variety with the high quality and yielding ability of the other two, with the aim of developing a bean better suited to mechanical harvesting.

Pea. Ottawa PE–11 (Onward x Horsford), a midseason variety of the Perfection type, shows promise for canning. Progress has been made in breeding for resistance to *Ascochyta pisi*; Ottawa A–100 (VC x American Wonder) has proved to be a good source of resistance. According to F_2 data from Wilt Resistant Thomas Laxton x A–100, resistance to *A. pisi* depends upon dominant duplicate factors.

Sweet corn. Breeding is in progress to develop single hybrids with early and medium maturity, for domestic and market gardens, and single hybrids for the processing trade in eastern Ontario.

To produce hybrids for the first purpose as early as or slightly earlier than Spancross 13.3 and Seneca 60, use of CO–11 (Banting inbred), CO–13 (Dorinny inbred), CO–15, CO–17 (Connecticut C3 selection) and C–20 is required. To obtain hybrids in the second-early group, 3–7 days later than Seneca 60, these inbreds should be combined with the later and larger-eared lines of the group CO–100 - CO–149 or medium-early inbreds of the series CO–50 - CO–99.

For processing, the best results have been given by combinations involving CO–100 (Dorick inbred), CO–104 (Connecticut C.13.53 selection), CO–108 (Sungold inbred), CO–150 (Connecticut C.22 selection) and CO–151 (Purdue P51 selection).

Report of Proceedings of the Western Canadian Society for Horticulture. Tenth Annual Meeting, Saskatoon, Saskatchewan, February 22, 23, 24, 1954. Pp. 122. (Mimeographed).

3669 *Leslie, W. R., Evans, W. D. & Shaw, D. A. The Prairie Co-operative fruit breeding project.* (*pp. 16–17*).

Brief general reports on breeding work on apples, strawberries and raspberries at the Morden, Edmonton and Saskatoon research stations are presented.

3670 *Shewfelt, A. L. & Unrau, P. The yield and quality of jelly from fifteen varieties of crab-apples.* (*pp. 37–38*).

Data on the yield, colour and flavour of the jelly of 15 varieties are given. The most satisfactory varieties in these respects were Dolgo and Bedford.

3671 *Walkof, C. Breeding tomatoes for prairie gardens.* (*pp. 46–48*).

The genetical principles involved in attempts to obtain a combination of large fruits and earliness in tomato varieties suitable for western Canada are outlined.

3672 *Young, L. C. Potato breeding at Fredericton, N.B.* (*pp. 59–68*).

Progress achieved in breeding for resistance to aphid virus-vectors, bacterial ring rot, leaf roll, scab and blight is reported.

3673 *Patterson, C. F. A report on potato breeding at the University of Saskatchewan, Saskatoon.* (*pp. 68–71*).

The major breeding objectives have been shallow eyes and scab resistance. The most promising material is a series of seedlings from the cross Netted x Earlaine.

3674 *Menzies, J. A. The potato breeding program at the University of Manitoba.* (*pp. 71–73*).

Breeding methods in use at the University of Manitoba, in particular for obtaining early scab-resistant varieties, are outlined.

3675 *Dabbs, D. H. A survey on the availability and hardiness of* Prunus *spp. being grown at prairie horticultural institutions.* (*pp. 95–108*).

The results of a questionnaire sent to Canadian horticultural research stations requesting information on the winter hardiness of varieties of *Prunus* spp. are tabulated.

3676 EVTUŠENKO, A. F.
(**Along Mičurin's road**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. Progr. Exp. Agric.) 1956 : No. 1 : 27–28. [Russian].

This account of breeding work at the Ukrainian Horticultural Research Institute mentions new varieties of apple, sweet cherry, peach and strawberry. The apples Slava Pobediteljam [Glory to Victors] (Papirovka x McIntosh) and Mleevskaja Krasavica [Mleev Beauty] (Winter Golden Pearmain x McIntosh) are notable for high yield, hardiness and fine quality and several others combine winter hardiness and drought resistance. The sweet cherries Kiev 2, Kiev 5, Kiev 6, Kiev 11 and Kiev 15 differ with regard to date of maturity; all are winter hardy and adapted to cultivation in the northern districts of the Ukraine. The peaches Kievskiĭ Samyĭ Ranniĭ [Kiev Very Early], Kievskiĭ Ranniĭ [Kiev Early], Kiev 01 and Kiev Pozdniĭ [Kiev Late] are tolerant of —32° C. and produce high quality fruits. Among the new strawberries, Kievskaja Rannjaja 2 [Kiev Early 2], which was obtained by multiple hybridization, is distinguished by great earliness. It is productive, hardy and drought resistant and has large berries with flesh of good flavour.

3677 KING, J. R.
The rapid collection of pollen.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 155–56.

A simple device for collecting anthers by means of suction is described. It is particularly useful for collecting small anthers, as in deciduous fruit trees and small fruits, or anthers difficult to extract.

3678 KLUGE, K. & KRAMER, S.
Über die stimulierende Wirkung des Colchicins bei der Samenkeimung von *Fragaria* und *Vaccinium*. (**On the stimulating effect of colchicine on seed germination in *Fragaria* and *Vaccinium***).
Arch. Gartenb. 1955 : **3** : 355–61.

Treatment of seeds of *V. myrtillus* ($2n = 24$) and *V. corymbosum* ($2n = 48$) and diploid and tetraploid varieties of *F. vesca* with 0·1–0·5% colchicine solutions for periods of from 24 to 72 hr. led to an acceleration in germination and, in the case of seeds that had been stored for some time, to increased germinability. In the case of diploid *F. vesca*, the seeds responded best to a 0·3% solution for 48 hr. but a 0·3 or 0·5% solution for 72 hr. was the most effective for tetraploid *F. vesca*. The germinability of seeds of *V. myrtillus* that had been stored for six months at room temperature was considerably increased by treatment with colchicine, a concentration of 0·5% giving the best results.

3679 KOCH, J. & BRETTHAUER, G.
Über den Vitamin C-Gehalt reifender Früchte. (**On the vitamin-C content of ripening fruits**).
Landw. Forsch. 1956 : **9** : 51–61.

Differences in the vitamin-C contents of cherry, black currant, strawberry, gooseberry, apple and pear varieties were observed; vitamin-C content was highest just before the fruits were fully ripe and a negative correlation was established between amount of rainfall and vitamin-C content. Those species and varieties that mature rapidly were found to contain more vitamin C than those that take a longer time to mature. It is suggested that breeding be directed at producing varieties that ripen quickly and contain oxidation inhibitors.

3680 LALATTA, F.
Prove sulla validità di un metodo per la valutazione comparativa della resistenza dei fruttiferi alla siccità. (**Proofs of the validity of a method for the comparative evaluation of the resistance of fruit trees to drought**).
Ann. Sper. agr. 1956 : **10** : 513–37.

The method of determining drought resistance by the capacity of cut leaves to retain moisture described by Eremeev (cf. *PBA*, IX, Abst. 835 and X, Abst. 1093) when tested on four cultivars of apple showed that Staymared lost less than the other three; in five vine rootstocks tested the lowest water loss was in 5BB and 161–49. Peach leaves lost less than those of apple, pear or cherry but only slightly less than plum leaves. It is pointed out that the behaviour of the leaves measures only the intrinsic resistance of the plants in question and that this may not in all cases correspond to their behaviour under drought conditions in practice.

3681 CLARKE, W. S. (JUN.) & RITTER, C. M.
Apple varieties in central Pennsylvania.
Bull. Pa. agric. Exp. Sta. 1955 : No. 605 : Pp. 34.

Based upon nearly 50 years' observations on trees grown in the orchards at University Park, descriptions are given of the characteristics of 131 varieties.

SCHAD, C., ARNAUD, R., BIDABE, B. & GRENTE, J.
Recherches d'arboriculture fruitière de la Station d'Amélioration des Plantes de Clermont Ferrand. I. Études sur le pommier. Compte rendu des travaux effectués de 1940 à 1953. (**Research on fruit trees at the Clermont Ferrand Plant Breeding Station. I. Studies on the apple. Account of work carried out from 1940 to 1953**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1955 : **5** : 247–70.

3682 *Bidabe, B. Autocompatibilité et intercompatibilité. (Self compatibility and intercompatibility). (pp. 249–53).*

In the 30 diploid and 6 triploid varieties studied the stigmas were found to be receptive to pollen from the time at which the buds turned red; receptivity was greatest immediately after the flower opened. The number of mature fruits obtained from self fertilization was 0–0·8% in the diploids and 0–0·5% in the triploids, the corresponding figures for the open-pollinated controls being 4–39% and 3·6–44% respectively. In the case of the triploids, best results were obtained when the trees were pollinated with pollen of diploid varieties. The best pollinators for 13 of the most important varieties at the station are listed; Jonathan, Red Delicious, Golden Delicious, Reine des Reinettes [Queen of the Reinettes], Cravert and Reinette du Mans [Le Mans Reinette] were good pollinators and compatible with most other varieties.

3683 *Bidabe, B. & Arnaud, R. Caractères des variétés. (Varietal characteristics). (pp. 254–62).*

Data on geographical origin, maturity group, chromosome number, value as a pollinator and morphology of inflorescences and flowers, fruits, leaves and young branches are provided for some 30 varieties in the Clermont Ferrand collection.

3684 *Grente, J. Dépérissement du pommier. (Apple-tree wilt). (pp. 263–70).*

The symptoms of apple-tree wilt, attributed to attack by *Fusarium* spp., are described. The rootstocks EMV, EMX, EMXIII, EMXV, Double Vigueur Ivory [Ivory Double Vigour], Doucin Orléans, Franc d'Orléans 40, Franc d'Angers 16, Franc 7, Franc 8, Franc 9, Franc 212 and Crab C were comparatively resistant; EMIV, EMVII, EMIX, Monton, Doucin Angers Tardif [Late Angers Doncin], Franc Angers 34 and Franc 5 proved highly susceptible.

3685 SCHMID, G.
Die Züchtung neuer Apfelsorten an der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau Wädenswil. (**The breeding of new apple varieties at the Federal Research Station for Viticulture and Horticulture, Wädenswil**).
Schweiz. Z. Obst- u. Weinb. 1956 : **65** : 212–14.

A brief historical account of work on apple breeding at the above Swiss research station is given, together with general information on trials of new apple varieties and rootstocks and the testing of foreign introductions there.

3686 DAHLGREN, K. V. O.
Fruktchimärer särskilt hos Åkeröäpplen. (**Fruit chimeras, especially in Åkerö apples**).
Svensk. bot. Tidskr. 1956 : **50** : 287–98.

Examples from the literature are given showing that fruits regarded as the result of vegetative hybridization or paraxenia may frequently be chimeras. A number of sectorial chimeras found in apples of the Åkerö type are described.

3687 GAGNIEU, A.
Étude d'une collection de variétés de pommier cultivées en France. Comportement caryologique et caractères du pollen. (**Study of a collection of apple varieties grown in France. Caryological behaviour and pollen characteristics**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1955 : **5** : 237–45.

The results of studies of some 300 varieties included in the collection at the Centre of Agronomic Research, Clermont-Ferrand, are tabulated. The information given for each variety includes data on chromosome number, whether or not meiosis is regular, the degree of morphological homogeneity of the pollen grains, the percentage of empty pollen grains, the percentage germination of the pollen grains, and whether climatic conditions exercise any influence on the percentage germination of the pollen grains.

3688 ENĂCHESCU, G.
Conţinutul în vitamina C a soiurilor de mere Romîneşti şi de provenienţă străină la maturitatea de consum şi în timpul păstrării. (**The vitamin C content of varieties of Rumanian apples and of varieties of foreign provenance when ready for consumption and after storage**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. **3** : 621–29.

The vitamin C content at maturity of a series of 23 Rumanian and 54 introduced varieties is given. The highest content was in the introduced variety Galben nobil [Noble Yellow]: 40 mg. %. The decline in vitamin C content during storage of 7 varieties was investigated. Among the varieties rich in vitamin C, Wagner and Parmen [Pearmain] showed the least falling off.

3689 DOMMERGUES, P., FLECKINGER, J. & MESSIÉ, R.
Sur une méthode de description des variétés de pommiers à cidre. (**On a method of describing cider apple varieties**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1955 : **5** : 335–443.

This article is devoted to a comprehensive study of the morphology of the flowers, fruit, leaves, branches and trunk of the more important varieties of cider apple grown in France. A key is provided to facilitate the identification of varieties on the basis of their morphological characteristics.

3690 SCHANDER, H.
Keimungsphysiologische Studien an Kernobst. V. Sortenvergleichende Untersuchungen über Einflüsse von Wärme- und Kältebehandlungen, die vor der Stratifizierung auf den Samen einwirkten). (**Studies on the physiology of germination in pome fruits. V. Comparative varietal studies of the effects of hot and cold treatments acting on the seeds before stratification**).
Z. Pflanzenz. 1956 : **35** : 345–61.

Three sets of experiments are described.

In the first, apples that had been harvested in a fully ripe condition were subjected to different temperatures during storage to ascertain the effect of temperature on the later germination of their seeds. It was found that, under these conditions, temperature requirements for maximum germination were the same as those during stratification (cf. Abst. 1686), temperatures of above 7–10° C. inhibiting germination and temperatures of 3° C. promoting the most rapid germination. In the second series of experiments, soaked seeds were subjected to high temperatures immediately prior to stratification, and, after stratification, sown under optimal conditions. Germination was inhibited, varieties that normally germinated rapidly being the most sensitive to this treatment. The effect of high temperatures was greatest when the seeds contained a high percentage of water. Sensitivity to high temperatures showed a positive correlation with stratification requirements, those varieties that needed low temperatures for long periods during stratification suffering the most from high temperatures prior to stratification. In the third set of experiments, soaked seeds were subjected to −18° C. for periods of from 6 hr. to 10 days. Considerable varietal differences were observed in reaction to this treatment, exposure to −18° C. for the shorter periods having a greater stimulative effect on the later germination of seeds of varieties susceptible to frost than on those of frost-resistant varieties. Varietal differences were also observed when seeds were exposed to −18° C. for the longer periods, the seeds of frost-susceptible varieties showing a much lower percentage germination than those of frost-resistant varieties. It is suggested that this method may offer a cheap and reliable means of mass selection for frost resistance, although it is recognized that resistance to frost in the seeds is probably not always a safe criterion of the frost resistance of the seedling or mature tree (cf. Abst. 1685).

3691 PETROV, A. K.
(Siberian-Turkestan hybrids of apple).
Priroda (Nature), Leningrad 1956 : No. 3 : 96–98. [Russian].

Mention is made of Tomič and other interspecific hybrids of the Siberian crab with unspecified European varieties; they are hardy under Siberian conditions and produce large fruits with flesh of good flavour. The hybrids, grown for 2–3 years in Siberia to acquire hardiness, were transferred to Turkestan for improvement in fruit characteristics, after which the scions from adult trees were grafted on Siberian crab stocks in Siberia.

3692 SHAY, J. R. & WILLIAMS, E. B.
Identification of three physiologic races of *Venturia inaequalis*.
Phytopathology 1956 : **46** : 190–93.

Race 1 of *V. inaequalis* is the race commonly found in the USA and various other countries. Race 2, collected in South Dakota, attacks *Malus baccata* 'Dolgo', *M. pumila* var. *niedzwetzkyana* 'Geneva' and certain back-cross selections from the Russian apple R12740-7A, its pathogenicity being controlled by three different genes, each specific for one of the three susceptible types. Race 3, from Nova Scotia, is pathogenic on Geneva, but the single gene determining its virulence differs from that found in race 2. (Cf. *PBA*, XXIV, Abst. 1394 and XXV, Abst. 1617).

3693 POSNETTE, A. F. & CROPLEY, R.
Apple mosaic viruses host reactions and strain interference.
J. hort. Sci. 1956 : **31** : 119–33.

Differences in reaction to virulent, intermediate and wild strains of apple mosaic virus were found among 18 rootstock and 12 scion varieties. Previous infection with the wild strain afforded protection against the virulent and intermediate strain.

3694 ZORIN, F. M.
(An interesting instance of variability in the pear).
Priroda (Nature), Leningrad 1956 : No. 5 : 114–15. [Russian].

A description is given of a pear tree producing fruits from vegetative organs in the Tuapse district and now under observation at the Soči research station.

3695 MANZO, P.
Contributo allo studio sull'autocompatibilità e sulla partenocarpia di alcune cultivar di pero. (**Contribution to the study of self compatibility and parthenocarpy in some pear cultivars**).
Riv. Ortoflorofruttic. ital. 1956 : **40** : 166–71.

Flowers of 32 pear varieties were bagged and self pollinated whilst others were emasculated and bagged without pollination. Most of those that bore fruit after selfing did so also when unpollinated, forming seeds without embryos; they are therefore classed as parthenospermic rather than self fertile, except the triploid variety Beurré d'Amanlis, which bore fruits with seeds containing embryos, evidently formed by parthenogenesis.

3696 Fruktose, Glukose und Saccharose in reifen Früchten. (**Fructose, glucose and sucrose in ripe fruits**).
Mitt. Klosterneuburg 1956 : **6** : 49–55.

Varietal differences in the total sugar contents and percentages of fructose, glucose and sucrose of ripe pears were noted at the Schönbrunn

Horticultural Research Station, Austria. Pears, in particular early-maturing varieties, were found to have a considerably higher fructose content and a much lower sucrose content than either apples or cherries.

3697 Smykov, V. K.
(The pear Sejanec Jarva).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 4 : p. 73. [Russian].

Sejenec Jarva [Jarva Seedling] from Tartu is productive, hardy and shows resistance to diseases. It arose from a stock previously grafted with Lesnaja Krasavica [Forest Beauty], the scion having been killed by frost.

3698 Singh, U. P.
A study of varietal incompatibility in loquat (*Eriobotrya japonica* Lindl.).
Indian J. Hort. 1955 : **12** : 115–16.

Tanaka, California Advance, Pale Yellow and Golden Yellow were selfed and crossed in all possible combinations at the Horticultural Research Station, Saharanpar, UP. Self incompatibility was complete in Golden Yellow and partial in the other varieties. The combinations with the highest percentages of fruit set, ranging from 52·5 to 57·5%, were California Advance x Pale Yellow and the reciprocal, California Advance ♀ x Tanaka ♂ and Pale Yellow x Golden Yellow and the reciprocal.

3699 Souty, J., Bernhard, R., Remy, P., Sanfourche, G. & Thomas, M.
Station de Recherches viticoles et d'Arboriculture fruitière du Sud-Ouest. Pont de la Maye (Gironde). Travaux effectués pendant la période 1938–1953 par la Section d'Arboriculture. [**Research Station for Vines and Fruit Trees of the Southwest, Pont de la Maye (Gironde). Work carried out by the Fruit-tree Section during the period 1938-53**].
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1955 : **5** : 121–236.

This report is concerned mainly with describing varieties of stone fruits at the above station and with giving the results of intervarietal and interspecific crosses effected there during the period 1938–53. Section I deals with the systematics of the peach, plum, cherry, apricot, nectarine and almond and provides morphological criteria for distinguishing one variety from another. In addition, the results of varietal and clonal trials are given and current breeding work is outlined briefly. A number of European peach varieties have been crossed with American yellow-fleshed varieties such as Dixired, Halehaven, Southland, Vedette and Veteran. Part II of the report is devoted to describing work on rootstocks for peach and plum trees; a number of peach x almond hybrids obtained at the station have given eminently satisfactory results as rootstocks for peaches. In addition a wide range of interspecific crosses within the genus *Prunus* has been carried out. Part III is concerned with the results of studies on the floral biology of stone fruits (cf. *PBA*, XXV, Abst. 1361).

3700 Cociu, V.
Noi hibrizi de plante pomicole. (**New hybrids of horticultural plants**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 567–73.

The role of hybridization in fruit-tree breeding is discussed in the light of Mičurin's views. Two promising hybrids are described: the apricot Silistra x Ananas [Pineapple], a vigorous hybrid with fruit of pleasant flavour; and the peach Chevreuse Tardive [Late Chevreuse] x Amazona Rubicunda, which combines high quality of fruit with adaptability to steppe and woody-steppe conditions.

3701 Plock, H.
Sortenbereinigung in einem Marillen-Anbaugebiet. (**Varietal purification in an apricot-growing district**).
Mitt. Klosterneuburg 1956 : **6** : 64–74.

In the district around Mainz, Germany, a large number of land races, the best known of which are Mombacher Frühe [Mombach Early], Perle von Mombach [Mombach Pearl] and Veit Mumm, are in urgent need of selection for improved fruit quality and increased vigour. The author, after outlining his method of identifying varieties by a study of the morphological characteristics of their stones (cf. *PBA*, XXV, Abst. 3357), puts forward criteria for the selection of suitable mother trees for propagation as clones.

3702 Welkerling, E. M. L. & Onorati, I. A.
Pistilos mal formados en flores de damasco: su posible origen genético. (**Malformed pistils in apricot flowers: their possible genetic origin**).
Rev. Invest. agríc., B. Aires 1956 : **10** : 107–11.

The number of flowers in which the pistil was atrophied was significantly greater in some varieties, such as Newcastle Early, than in others; since the differences were maintained in different years and were not associated with earliness they are regarded as genetic characteristics of the varieties.

3703 Schad, C., Grente, J. & Arnaud, R.
Recherches d'arboriculture fruitière de la Station d'Amélioration des Plantes de Clermont Ferrand. II. Le dépérissement de l'abricotier. Compte rendu des travaux effectués de 1951 à 1953. (**Research on fruit trees at the Clermont Ferrand Plant Breeding Station. II. Apricot wilt. Account of work carried out from 1951 to 1953**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1955 : **5** : 271–85.

Apricot wilt may be due to lack of compatibility between stock and scion, to the roots being attacked by larvae of *Capnodis tenebrionis* or to infection of the roots by *Verticillium dahliae*, *Xanthomonas pruni* or *Fusarium* spp.; the symptoms caused are similar to those found in the final stages of apoplexy. Selection of rootstocks resistant to bacterial and fungous attack is outlined; clones Saint-Julien 5, Vitry 3 and Damas Toulouse 1 and 2 have proved promising.

3704 Blasse, W. & Freytag, H. E.
Pulfrichphotometrische Untersuchungen an *Prunus*-Artbastarden. (**Investigation on interspecific hybrids of *Prunus* with the Pulfrich photometer**).
Arch. Gartenb. 1955 : **3** : 385–95.

With a view to studying the inheritance of juice colour in cherries, crosses were carried out at the Müncheberg Institute for Field Crops and Horticulture, Eastern Germany, between the sour cherry Schattenmorelle, a variety with dark-red juice, and the sweet cherry Dönissens Gelbe Knorpelkirche [Dönissen's Yellow Cartilage cherry], which has light-yellow to colourless juice. The parent species have $2n = 32$ and $2n = 16$ respectively and the nine hybrids obtained proved to be triploids with 16 chromosomes from the ♀ parent and 8 from the ♂ parent. The hybrids flowered profusely and produced abundant pollen but set very few fruits; six produced fruit with juice similar in colour to that of the ♂ parent and the other three juice of the same colour as that of the ♀ parent. Dark-red juice was shown to be due to the presence of anthocyanin and colourless or light-yellow juice to flavone. It is postulated that the production of anthocyanin is determined by a single dominant gene and the production of flavone by its homozygous recessive allele.

3705 Hrubý, K.
The cytology of tetraploid cherries.
Studia bot. čechosl. 1950 : **11** : 87–97.

The chromosome behaviour of a number of tetraploid cherry varieties at the first division of meiosis was investigated. The sour and amarello cherries were characterized by the formation of bivalents and a low percentage of quadrivalents, but in the Duke and Glass cherries a high percentage of quadrivalents occurred. It is thought that the Duke and Glass cherries originated through fertilization of an unreduced diploid gamete of *Prunus avium* by a normal haploid gamete of *P. cerasus*. The findings are discussed in relation to the probable polyphyletic hybrid origin of *P. avium* and *P. cerasus*.

3706 Zdruĭkovskaja-Rihter, A. I.
(**The production of early sweet cherry seedling varieties by raising the embryos in artificial cultures**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 22 : 56–67. [Russian].

A report from the Nikita Botanical Garden on artificial culture of the embryos of early sweet cherry varieties to overcome the difficulty presented by nonviable seed is presented. For improvement of the vitality of the young plants, hybrid seed obtained by open pollination, fertilization by pollen mixtures or the pollen of a single variety, was used. Two very early forms were obtained from the stones of open-pollinated Krasnaja Maĭskaja [Red May]. These are earlier than the initial variety and earlier even than the early standard Rannjaja Rynka [Market Early], they produce larger fruits with firmer flesh of finer flavour.

3707 Maliga, P.
Badacsonyi és Germersdorfi cseresznye termékenyülési adatai. (**Data on the fertilization of Badacsony and Germersdorf cherries**).
Agrártud. Egy. kert- szőlőTud. Kar Évkön. 1952 : **3** : 27–49.

Details of the compatibility relationships and flowering times of a number of varieties grown in Hungary are given with particular reference to the pollination of the self-incompatible varieties Badacsonyi óriás [Badacsony Giant] and Germersdorfi óriás [Germersdorf Giant].

3708 SLOVIḰ, D.
(A study of the Ohrid cherries).
God. Zborn. zemjod.-šumarsk. Fak. Univ. Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje)/Ann. Fac. Agric. Sylvicult. Univ. Skopje Zemjod : 1951/52 : **5** : 45–85. [Macedonian].

A number of varieties, with large fruits and flesh of fine flavour, from the shore of Lake Ohrid are described. The most common varieties are Dalbazlija and Ohridska Crna [Ohrid Black], the former distinguished by great earliness and the other by flesh of a crunchy consistency and good transportability.

3709 TETEREV, F. K.
(Sweet cherries for the Leningrad province).
Agrobiologija (Agrobiology) 1956 : No. 2 : 17–27. [Russian].

Rannjaja Rozovaja [Early Pink], Černaja Rannjaja [Black Early], Krasnaja Plotnaja [Red Firm] and other new fine varieties of sweet cherry which are hardy and productive under Leningrad conditions are reported. They were all obtained at Pavlovsk by grafting open-pollinated seedlings of the Kozlovsk sweet cherry upon sour-cherry stocks. The new varieties differ with regard to maturation, fruit colour and consistency and flavour of the flesh. Krasnaja Plotnaja has flesh of a crunchy consistency.

3710 KÁRPÁTI, Z.
Még néhány szó *Prunus fruticosa* x *mahaleb* hybrid kérdéséhez. **(Further remarks on the problem of the hybrid *P. fruticosa* x *P. mahaleb*).**
Agrártud. Egy. kert- szőlőTud. Kar Évkön. 1951/2 (1953) : **2** : No. 2 : 51–54.

The author identifies a hybrid discovered in the vicinity of Budapest as *P. javorkae* (*P. fruticosa* x *P. mahaleb*), thus disagreeing with Pénzes, who considers it to be *P. cerasus* x *P. fruticosa*. The author further disputes the claim of Pénzes that lanceolate leaves are dominant over broad leaves by showing that both broad and narrow-leaved forms occur in the hybrid *P. avium* x *P. fruticosa*.

3711 HAGLER, T. B. & JOHNSON, W. A.
Peach varieties for Alabama.
Leafl. Ala. agric. Exp. Sta. 1956 : No. 48 : Pp. 6.

Descriptions are given of 21 varieties, together with information on their chilling requirements.

3712 GRASSELLY, C.
La bouture de feuille. Nouvelle méthode de multiplication végétative d'un hybride pêcher x amandier utilisé comme porte-greffe. **(The leaf cutting. A new method of vegetative propagation of a peach x almond hybrid used as rootstock).**
Rev. hort. suisse 1956 : **29** : 116–18.

A peach x almond hybrid that can be readily propagated by vegetative means has been bred at the Grande Ferrade Fruit Tree Station, SW France. Treatment of leaf cuttings of this hybrid with a concentration of 125 ppm. indolebutyric acid was found to be an efficacious method of propagation.

3713 STANKOVIČ, D. & BULATOVIČ, S.
Prilog poznavanju osetljivosti nekih sorti bresaka, kajsija i krušaka prema zimskim mrazevime. **(Contribution to the investigation of the susceptibility of some apricot, peach and pear varieties to frost).**
Zaštita Bilja 1955 : No. 30 : 71–77.

The amount of frost injury to buds of different varieties of fruit trees, notably peaches, was investigated in some districts of Serbia in the winter of 1953–54. Among the peaches, Red Bird, Morettini I, Mayflower, Wheeler, Amsden, Halberta, Early River's and Miss Lola were distinguished by hardiness.

3714 HODGSON, R. W.
Origin of citrus fruits grown in California.
Calif. Citrogr. 1955 : **40** : 118, 132–34, 136.

The history, classification and nomenclature of citrus fruits in California are discussed.

3715 ZORIN, F. M.
(Changes occurring under the influence of grafting).
Agrobiologija (Agrobiology) 1956 : No. 2 : 124–25. [Russian].

A tree of an unspecified citrus species at Soči bears the scions of 23 other varieties and forms. These include the pomelo Oju, the mandarin Černomorskiĭ [Black Sea] and Hybrid 1 [orange x Unshu (= Satsuma) mandarin], in all of which the stock has induced morphological changes: Oju has smooth instead of rough-skinned fruits, the mandarin orange-coloured instead of yellow fruits and Hybrid 1 produces seed of a different shape and size.

3716 Leroy, J. F.
Les mûriers des Andes et de l'Afrique tropicale. (**The mulberries of the Andes and of tropical Africa**).
J. Agric. trop. Bot. appl. 1955 : **2** : 676–79.

On the basis of various morphological criteria the mulberries of the world are divided into three subgenera, native to Asia and America, tropical America and tropical Africa and designated *Eumorus*, *Gomphomorus* and *Afromorus* respectively (cf. *PBA*, XX, Abst. 1876). The author outlines the principal differences between the two latter subgenera that he has proposed and illustrates their distinctive morphological characteristics by means of drawings.

3717 Priadcencu, C. & Craiciu, E.
Determinarea celor mei bune varietăţi de dud pentru creşterea viermilor de mătase. (**Determination of the best mulberry varieties for rearing silkworms**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 447–61.

Four varieties were compared. Roz de Lombardia [Lombardy Pink] combined high foliage yield with capacity of the leaves to maintain freshness for some time after picking.

3718 Bembower, W. & Anchern Champoopho.
Mango varieties of Thailand.
Indian J. Hort. 1955 : **12** : 58–62.

Notes are given on the meaning of the names and on some of the characteristics of many local varieties.

3719 Baldini, E. & Scaramuzzi, F.
Contributo ad una indagine pomologica sulle cultivar di diospiro. Parte II. (**Contribution to a pomological study on cultivars of persimmon. II**).
Ann. Sper. agr. 1956 : **10** : No. 2 : Suppl. : i–xx.

The second part of this monograph (cf. Abst. 2791) gives descriptions of a number of cultivars of *Diospyros kaki* having fruits that are astringent at the time of picking even when fertilized and become edible only after storing. Descriptions are also given of *D. lotus* and *D. virginiana*. Several of the cultivars introduced under different names have proved to be identical.

3720 Cociu, V.
Criterii pentru studiul pomologic al nucului. (**Criteria for the horticultural study of the walnut**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 429–45.

Characters of significance in varietal diagnosis are discussed, in particular features of the shell and kernel. Some local Rumanian varieties are used for illustration.

3721 Šmidt, O. Ju. [Editor].
(**The walnut and its cultivation in the USSR**).
Priroda (Nature), Leningrad 1956 : No. 4 : 104–06. [Russian].

This survey of articles received by *Priroda* mentions selection work on local walnut forms from Podgornoe, Voronež province, distinguished by hardiness, thin shells and large kernels.

3722 Schad, C. & Grente, J.
Recherches d'arboriculture fruitière de la Station d'Amélioration des Plantes de Clermont Ferrand. III. – Amélioration du noyer. Compte rendu des travaux effectués en 1953. (**Research on fruit trees at the Clermont Ferrand Plant Breeding Station. III. Walnut breeding. Account of work carried out in 1953**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1955 : **5** : 286–301.

In this account of methods of controlling ink disease, caused by *Phytophthora cambivora* and *Ph. cinnamomi*, mention is made of crosses between *Juglans nigra* and *J. regia* that have given rise to rootstocks combining resistance to the disease with other desirable features such as rapid and vigorous growth. Breeding for resistance to drought and frost is being initiated.

3723 Cole, J. R. & Gossard, A. C.
Stuart pecan found to be susceptible to scab in Mississippi.
Plant Dis. Reptr. 1956 : **40** : p. 156.

After remaining resistant to scab (*Cladosporium effusum*) for over half a century, the variety Stuart has recently shown suceptibility in south-eastern Mississippi.

3724 Berry, F. H.
Present status of chestnut breeding work in the United States Department of Agriculture.
3e Sess. FAO Comm. int. Chât., Rome 1955 : FAO/CH/15–A : Pp. 3.

Progress achieved in the USA in breeding for resistance to blight and for improved yield and quality of wood is outlined briefly.

3725 NIENSTAEDT, H.
Receptivity of the pistillate flowers and pollen germination tests in genus Castanea.
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 40–45.

The period of pollen receptivity of two Japanese chestnuts (*C. crenata*), two Chinese chestnuts (*C. pumila*) and two hybrids between these species was studied; it was found that the stigmas did not become fully receptive until from 5 to 13 days after the commencement of anthesis in the male catkins and remained receptive for at least a week. Artificial pollination gave the best results when carried out 10–13 days after the beginning of anthesis. Emasculation did not reduce the number of nuts set but bagging tended to bring about a reduction in yield. In pollen germination tests good results were obtained by using drops of distilled water or a sucrose solution at a temperature of 28–37° C.; the addition of boric acid proved detrimental. The fact that chestnut pollen germinates best at relatively high temperatures suggests that artificial pollination should be carried out on fairly warm days.

3726 SCHAD, C., GRENTE, J. & SOLIGNAT, G.
Recherches d'arboriculture fruitière de la Station d'Amélioration des Plantes de Clermont Ferrand. IV. Amélioration du chataignier. Compte rendu des travaux effectués en 1953. (**Research on fruit trees at the Clermont Ferrand Plant Breeding Station. IV. Chestnut breeding. Account of the work carried out in 1953**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1955 : **5** : 302–24.

Requirements in France are resistance to *Phytophthora* ink disease, blight (*Endothia parasitica*), drought and frosts; Japanese and Chinese varieties introduced for their resistance to ink disease have proved ill-adapted to chestnut-growing areas in France as they are highly susceptible to frosts and drought, grow slowly and produce too little wood. Selection within *Castanea sativa* and hybridization of *C. sativa* with *C. crenata* has, however, given some clones that are resistant to ink disease and also well adapted ecologically. Susceptibility to ink disease was dominant in F_1 hybrids. Studies were made of the floral biology of *C. sativa*, *C. crenata* and *C. mollissima* with special reference to intercompatibility and intersterility relationships. A programme of breeding for resistance to canker was initiated; several resistant trees were found in the species *C. sativa*, *C. crenata* and *C. mollissima* and in the hybrid progeny of *C. crenata* x *C. sativa*.

Comptes Rendus de la Conférence Arachide-Mil Bambey (Sénégal). 5–13 Septembre 1954. [**Report on the Groundnut-Millet Conference, Bambey (Sénégal), 5-13 September 1954**].
Bull. agron. Fr. d'out. mer 1955 : No. 12 : Pp. 222.

The above conference was attended by delegates from French, British and Portuguese territories in Africa and dealt with questions concerning cultural techniques and breeding. The following papers of interest to plant breeders were presented. In addition the report includes an account of visits to trial fields at Bambey and its substations, the gist of different discussion groups held and a bibliography of works published on millet and sorghum by the Technical Section for Tropical Agriculture, Nogent-sur-Marne, from 1900 to 1954.

3727 *Sauger, L. Quelques facteurs de sélection de l'arachide. (Some factors in groundnut breeding). (pp. 90–94).*

Principal breeding aims at the Bambey Agronomic Research Centre include the development of high-yielding, early-flowering varieties with small pods and an improved oil content. As total yield of oil per ha. has been shown to be largely dependent upon the number of pods produced emphasis is being placed on breeding for rapid growth and early flowering. Preference is being given to the breeding of erect rather than runner varieties as the former are more easily harvested.

3728 *Bouffil, F. & Sauger, L. Incidence de la sélection naturelle sur le choix des lignées sélectionnées à vulgariser en milieu indigène. (Influence of natural selection on the choice of selected strains for release in a native environment). (pp. 95–98).*

One of the greatest difficulties encountered by the Bambey Agricultural Research Centre in the distribution of groundnut strains has been that native farmers fail to appreciate the importance of maintaining varietal purity. Some new varieties tend, however, to hold their own better than others and, with a view to elucidating this problem, experiments with mixed sowings of three varieties were begun in 1937 to study the effect of natural selection on the varietal composition of the total population.

After 11 years two of the lines, 24–11 and 28–206, had practically disappeared, leaving only 24–5. An analysis of the yield components of the three varieties showed that the selective advantage enjoyed by 24–5 was due to the fact that, although its total yield in weight was not greater than that of the other two varieties, it produced a considerably larger number of seeds. It is therefore suggested that, for release to native farmers, pure-bred varieties giving high yields of small seeds are likely to be the most successful.

3729 *Catherinet, M., Sauger, L. & Tardieu, M. Perspectives nouvelles pour la lutte contre la rosette de l'arachide. Les lignées sélectionnées résistantes. (New prospects for the control of groundnut rosette. The resistant selected lines). (pp. 99–104).*

The eleven lines of Virginia Bunch selected at Bambey for resistance to chlorotic rosette (cf. *PBA*, XXIV, Abst. 3331 and XXV, Abst. 1388) were found to give yields up to 40% higher than those of susceptible varieties under conditions of severe infection but to be markedly inferior in yield in the absence of the disease. Crosses and back crosses between the resistant lines on the one hand and high-yielding but susceptible varieties on the other are now being carried out in an attempt to combine resistance and productivity. A study is also being made of the genetical basis of resistance.

3730 *Bono, M. Des caractères dans la sélection des sorghos et mils* Pennisetum. *(Some characters in sorghum and* Pennisetum *millet breeding). (pp. 122–36).*

The work of the Agronomic Research Centre, Bambey, in classifying species, varieties and strains of sorghum and millet according to various morphological characters is outlined. The criteria employed, including colour of leaves, glumes, nodes, stamens and seed, degree of hairiness of different plant organs and number of days from sowing to earing, flowering and maturity respectively, are listed and an indication is given as to which characters are of importance in breeding.

3731 *Sauger, L. Un problème d'amélioration des variétés d'arachide. La richesse en huile. (A problem in the breeding of groundnut varieties. The oil content. (pp. 137–44).*

An analysis of the oil contents of the dried mature kernels of erect, semierect and runner strains at Bambey showed that varietal differences in oil content did not exceed 5%. From the point of view of total oil production per ha., the yield potential of the variety, its adaptability to its environment and the proportion of shell to total weight of harvested nuts were more important than the oil content of the kernel. Attempts are being made to obtain strains with an improved oil content both by selection from existing varieties and by the artificial induction of mutations.

3732 *Clérin, M. Le mil et l'arachide au Soudan Français. (Millet and groundnut in the French Sudan). (pp. 167–70).*

A brief note on current breeding work in the French Sudan is included. Two groundnut introductions from Bambey, 28–206 and 28–207, have given favourable results; 28–206 performs well in areas with a low rainfall while 28–207 is best suited to the southern parts of the territory. The edible varieties Kolda, Rustembourg and Chine [China] have also proved promising.

3733 *Maurer, M. L'arachide dans le nord de la Nigeria. Recherche et amélioration. (The groundnut in northern Nigeria. Research and breeding). (pp. 183–84).*

A brief account is presented of breeding work at the Samaru Research Station and at the Kano and Dama substations. Kano 38 and Kano 50, both selected from material introduced from Ceylon in 1928, have given good results, as have also Samaru and Castle Cary, both of which were selected from crosses between indigenous varieties.

3734 *Barbe, M. Travaux effectués sur l'arachide à la station agricole du Nord-Cameroun (Guétalé) (Cameroun Français). [Work carried out on the groundnut at the North Cameroons (Guétalé) agricultural station (French Cameroons)]. (pp. 185–91).*

An account of breeding work in progress at the above station is included. Emphasis is being placed on the development of erect varieties suitable for mechanical harvesting and adapted to the climatic conditions of this region, which is characterized by a low rainfall. Good results have been obtained from Soudan 28.206, introduced from French Equatorial Africa. Promising results have also been obtained from 28–206 SAG, 28–206 Bould and 28–207 Bambey.

3735 *Barbe, M. Travaux effectués sur les mils et sorghos à la station agricole du Nord-Cameroun (Guétalé) (Cameroun Français). [Work carried out on millets and sorghums at the North Cameroons (Guétalé) agricultural station (French Cameroons)]. (pp. 192–97).*

The results of variety trials at the above station from 1949 to 1953 are given. Of the millets tested Yadiri gave the highest yields, despite its susceptibility to lodging and *Dysdercus* sp. The sorghum varieties Boulbassiri and Djigari gave the best results among the sorghums. Djigari, however, is susceptible to lodging, smut and rust. Yolobri, a variety highly resistant to lodging, gave moderately good yields.

3736 *Niqueux, M. Les sorghos cultivés dans le territoire du Tchad. Leur amélioration.* (*Sorghums grown in the Chad territory. Their breeding*). (*pp. 198–202*).

Sorghum species and varieties grown in the Chad territory are classified according to their growth cycles and ecological requirements. Brief information on breeding objectives is included.

3737 *Niqueux, M. Essais variétaux et culturaux sur l'arachide à la station de Recherches Agronomiques du Ba-Illi* (*Tchad*). [*Varietal and cultural trials of groundnut at the Ba-Illi* (*Chad*) *Agronomic Research Station*]. (*pp. 203–06*).

The Bambey line 28–206 and local selections of Virginia Bunch gave the best results in trials conducted in 1951–53 at the above station.

3738 *Veyret. Action de la colchicine sur* Arachis hypogaea. (*Action of colchicine on* A. hypogaea). (*pp. 212–13*).

Germinating seeds of Valencia and 24–11 were treated with a 0·2% colchicine solution. This concentration appeared to be toxic to Valencia but, in the case of 24–11, several mutants with morphological anomalies were obtained. No cases of polyploidy were observed. Cytological studies of the pollen mother cells of the aberrant plants revealed abnormalities at meiosis.

3739 JOHANSEN, E. L. & SMITH, B. W.
***Arachis hypogaea* x *A. diogoi*. Embryo and seed failure.**
Amer. J. Bot. 1956 : **43** : 250–58.

In crossing *A. hypogaea* ($2n = 40$) with *A. diogoi* ($2n = 20$), fertilization occurred as frequently as in natural self pollination of *A. hypogaea*. The hybrid embryos and endosperms grew very slowly for the first 24 days; the pegs penetrated the soil and underground pod development began. The endosperm collapsed at the 32– or 64–nucleate stage. The embryo survived longer, sometimes reaching a size of 100–260 cells, but remained undifferentiated. Endosperm collapse occurred after hyperplastic development of the maternal tissues of the seed.

3740 CARPENTIER, S.
Action de la colchicine sur les racines et radicelles d'arachide. (**The action of colchicine on the roots and rootlets of the groundnut**).
Rev. Cytol., Paris 1954 : **15** : 153–78.

In roots and rootlets treated with a 0·005% colchicine solution, the frequency of c-mitotic cells among the total number of dividing cells decreased from about 68% on the first day to 18% on the fifth day of treatment. Some cells underwent several c-mitoses, becoming highly polyploid giant cells with, in some cases, $2n = 64$; the giant cells occasionally resumed normal division.

3741 TARDIEU, M.
Étude morphologique sur les fleurs d'arachide. (**Morphological study of groundnut flowers**).
Bull. agron. Fr. d'out. mer 1954 : No. 13 : 113–17.

The cultivated varieties of *Arachis hypogaea* represented in the collection of the Bambey Research Station are accorded a preliminary classification according to the morphology of their flowers. It was found that, in general, late-maturing varieties such as 24–11 had triangular wings and early-maturing varieties such as 28–204 falcate wings; several exceptions to this rule were, however, noted. The above two main groups could be further subdivided on the basis of the morphological characteristics of the calyx, the calyx tube and the standard. A close association, possibly due to the pleiotropic action of one or more genes or to linkage between genes, was observed between type of wing and the shape of the calyx. Plants suffering from rosette had invariably a purplish calyx, a feature that enables them to be detected immediately in breeding work. Crosses have been carried out between 28–204 and 24–11 to study the mode of inheritance of wing shape and other morphological characteristics of the flower.

3742 SAUGER, L., CATHERINET, M. & DURAND, Y.
Contribution a l'étude de la rosette chlorotique de l'arachide. (**Contribution to the study of chlorotic rosette of the groundnut**).
Bull. agron. Fr. d'out. mer 1954 : No. 13 : 163–80.

Trials of the eleven resistant lines selected at Bambey (cf. *PBA*, XXIV, Abst. 3331 and XXV, Abst. 1388) showed that they retained their resistance under widely differing ecological conditions. No correlation could be established between morphological or physiological characteristics on the one hand and degree of resistance on the other. The resistant lines are somewhat unsatisfactory as regards yield (cf. Abst. 3729) and further selection for this character is necessary. The occurrence of physiological races of chlorotic rosette is suspected.

3743 BHAVANI SHANKAR RAO, M. & KOYAMU, K.
The dwarf coconut.
Indian Cocon. J. 1955 : **8** : 106–12.

Two dwarf forms of *Cocos nucifera* var. *nana* are described, viz. f. *nana* (dwarf orange), and f. *maldiviana* (dwarf green). Although both types compare unfavourably with the normal tall palms in vigour, yield, quality and other characters, the dwarf green form appears to yield vigorous hybrids when used as a pollen parent in crosses with the tall form.

3744 NIXON, R. W.
Off-type palms in commercial date gardens.
Rep. 30th annu. Date Gr. Inst. Coachella 1953 : 8–9.

An offtype of Deglet Noor with fruits of inferior quality is described. Such offtypes are believed to have arisen from seedlings found growing close to the trunk of the parent plant and consequently confused with offshoots.

3745 PEREAU-LEROY, P.
Variétés de dattier résistantes à la fusariose. (**Varieties of date resistant to *Fusarium***).
Fruits d'outre mer 1954 : **9** : 450–51.

A list of north-African varieties resistant to *F. albedinis* is presented. Most of them bear fruits of inferior quality but Takerboucht and Bou Ijjou have potentialities as dessert varieties for the European market.

3746 ZITO, F. & SPINA, P.
Come germina il polline dell'olivo. (**How the pollen of the olive germinates**).
Ital. agric. 1956 : **93** : 413–25.

Studies on pollen germination in ten Sicilian cultivars showed that very little germination took place in the first 12 hours. The most effective medium was a 15% solution of sucrose, with a trace of boric acid; better results were obtained with smears than with the hanging-drop method. Marked differences were observed between varieties, Calatina giving 73·6% germination, whereas Giarraffa gave only 9·7%. There were no signs of a high degree of sterility of the pollen such as has been reported by other investigators.

3747 PACI, P.
Osservazioni sul valore della morfologia dello stimma nella classificazione delle cultivar d'olivo. (**Observations on the morphology of the stigma for the classification of olive varieties**).
Ann. Sper. agr. 1956 : **10** : No. **3** : Suppl. : xxxv–xlv.

Observations were made on 12 table varieties and 12 oil varieties and the characteristic outlines of the stigma are illustrated for each variety. Certain varietal differences were detectable but some varieties easily identifiable by other means had stigmata of identical shape. In certain cases variations in stigma form within the variety were observed and the character is not regarded as having great diagnostic value.

3748 MASSIEU H., G. RUÍZ QUILES, A. & CRAVIOTO, R. O.
Nuevos datos sobre el contenido de vitamina C de *Malpighia punicifolia* L., procedente de Yucatán. (**Further data on the vitamin C content of *M. punicifolia* L. from Yucatan**).
Ciencia, Méx. 1955 : **15** : 206–07.

A content of 1900 mg. % in the ripe fruits and 2650 mg. in unripe fruits is reported in specimens of *M. punicifolia* collected in Yucatan.

3749 STAMBAUGH, S. U.
A new hybrid Papaya backcross Blue Solo on Solo.
Proc. Fla. hort. Soc. 1955 : **68** : 282–84.

F_1 hybrids between inbred Solo ♀ and inbred Blue Solo ♂ are noteworthy for their marked hybrid vigour, sweet flavour and uniformity in fruit shape and texture. It is suggested that F_1 seed stocks could be regularly produced for commercial use.

3750 SINGH, R. N.
Further studies in colchicine induced polyploidy in papaya (*Carica papaya* Linn.).
Indian J. Hort. 1955 : **12** : 63–71.

Further investigations have shown colchicine-induced tetraploids to be of no economic importance since they are highly ♀ and ♂ sterile, producing round fruits, chiefly parthenocarpic, which are much reduced in size (cf. *PBA*, XXIV, Abst. 1434).

3751 NAKASONE, H. Y. & STOREY, W. B.
Studies on the inheritance of fruiting height of *Carica papaya* L.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 168–82.

In a study of progenies derived from crosses between Betty, a semidwarf variety with a tendency to fruit early, and Solo, a tall late-fruiting type, at the Hawaii Agricultural Experiment Station, height from the cotyledonary node to the first flowering node, number of nodes in this length of the stem, internode length and earliness of flowering were found to be quantitatively inherited. No evidence of heterosis or complete dominance was obtained. Height at which initial flowering took place and earliness of flowering were highly correlated with node number. Approximately equal numbers of nodes were produced by all progenies in a given period of time; it is therefore concluded that height of initial flowering depends upon the production of a definite minimum number of nodes which differs according to variety, early bearing types flowering after the production of fewer nodes. Internode length is regarded as being of only minor importance in influencing height of initial flowering and earliness.

3752 Swarbrick, T.
Improving the raspberry.
Agric. Rev., Lond. 1956 : **1** : No. 9 : 25–30.

An account of the local traditions and problems of the raspberry industry in Scotland is followed by an outline of breeding and investigations on virus diseases at the Scottish Horticultural Research Institute, Mylnefield, and at the institute's West of Scotland Unit maintained at the Agricultural College, Auchincruive, Ayr. The main aim of breeding is the development of varieties combining high yield and good processing qualities. Several new seedlings show sufficient promise to merit consideration as commercial introductions.

Mention is made of a variety homozygous for the thornless condition, obtained from a cross effected between Lloyd George and Burnetholme Seedling in 1952. Its yield, flavour and texture are satisfactory. Interspecific hybridization is also in progress.

3753 Neumann, U.
Die Bedeutung der Befruchtungsverhältnisse und Pflegemassnahmen für den vorzeitigen Früchtefall bei Schwarzen Johannisbeeren. (**The importance of fertilization conditions and cultural measures for premature fruit drop in black currants**).
Arch. Gartenb. 1955 : **3** : 339–54.

Investigations at the Marquardt Institute of Fruit Cultivation and Fruit Breeding, Potsdam, Eastern Germany, showed that insufficient natural pollination is the main cause of fruit drop and that yields can be substantially increased by artificial pollination (cf. *PBA*, XXIV, Abst. 2436). The varieties tested were divided into three categories. The first group comprised fully self-fertile varieties such as Goliath, Rosenthals Schwarze [Rosenthal's Black] and Boskoop Giant; although supplementary pollination improved the yield of these varieties, self pollen was as effective as pollen from other varieties. Varieties of the second group, which included Wellington and Westwick's Choice, were largely self fertile but produced somewhat higher yields when cross pollinated. Varieties of the third group, which included Laxton's Mite-free, Invincible Giant and Black Naples, were self sterile to a large degree and set only 20–30% as much fruit when selfed as when cross pollinated. Varieties of the third group also gave lower yields than those of the first group when they were pollinated with pollen of another variety, possibly owing to their having fewer ovules. The number of seeds per berry showed a positive correlation with yield and it is therefore considered unlikely that breeding for high yields of berries with few seeds per berry is possible with the material under observation. The cultivation of varieties in the third group is not recommended; to obtain satisfactory results with those in the second group, at least 2 or 3 varieties should be grown together. No conclusions were reached with regard to the effect of pruning, fertilizer treatment or irrigation on fruit set; hormone treatment is not considered to have any practical value in reducing fruit drop.

3754 Johansson, E.
Sortförsök med svarta vinbär i Sverige 1943–1955. (**Varietal trials of black currants in Sweden, 1943-1955**).
Medd. Stat. Trädgårdsförsök 1956 : No. 95 : Pp. 19.

Further information is given on the results of trials of which a preliminary report appeared in *PBA*, XXII, Abst. 1431. At stations in southern Sweden, Wellington XXX, Silvergieter, Seabrook and an unnamed variety here designated Edina gave the heaviest yields, while in central Sweden Wellington X and Brödtorp yielded more. Under very cold conditions at Odensala, Jämtland, Silvergieter and Wellington X were among the heaviest yielding varieties and surpassed some of the more hardy Finnish and Swedish varieties. In northern Sweden, however, Brödtorp, Janslunda and Östersund were the most reliable varieties.

3755 **New blueberry named Blueray.**
NJ Agric. 1956 : **38** : p. 15.

Developed by the New Jersey Agricultural Experiment Station and the USDA from the cross GM37 (Jersey x Pioneer) x CU5 (Stanley x June), Blueray is vigorous and easily propagated, bears large berries of good flavour and is hardier than many varieties. It is of the same maturity season as Ivanhoe but has been more consistently productive in Michigan, New England and New Jersey.

3756 NIKITIN, G. I.
(*Elaeagnus*).
Priroda (Nature), Leningrad 1956 : No. 4 : p. 117. [Russian].

E. macrophylla, which is immune from pests and diseases, is thought to have value for distant hybridization. In the USSR it is found in Sahalin, where it had probably been introduced from Japan.

3757 **Wild elderberry is tamed, named.**
Amer. Fruit Gr. 1956 : **76** : No. 4 : p. 61.

The elderberry variety Adams is being distributed by the New York State Fruit Testing Association, Geneva, for trial by growers. Its clusters and berries are larger than those of wild elderberries (cf. Abst. 3668).

3758 FALCH, J. & STRAUSS, E.
Abschlussbericht über Sortenvergleich- und Leistungsprüfungen im Erdbeersortiment 1951–1954. (**Final report on comparative varietal trials and yield trials of the strawberry collection, 1951-54**).
Mitt. Klosterneuburg 1956 : **6** : 55–64.

The varieties Regina, Macherauchs Frühernte [Macherauch's Early Harvest], Georg Soltwedel, Madame Moutot and Mieze Schindler are described. In trials at the Klosterneuburg Research Station, Austria, these varieties outyielded all others and are recommended for cultivation on a commercial scale in the Vienna region.

3759 Une nouveauté dans le monde de la fraise . . . le fraisier grimpant. (**A novelty in the strawberry world . . . the climbing strawberry**).
Courr. hort. 1956 : **18** : p. 239.

The new climbing strawberry Truffaut Prodige [Truffaut Prodigy] is described (cf. Abst. 2817).

3760 Beter dan Deutsch Evern. (**Better than Deutsch Evern**).
Fruitteelt 1956 : **46** : 642–45.

Breeding work on strawberries at the Zaltbommel Research Station, Netherlands, is reviewed briefly. Several new high-yielding varieties have been developed, including K104–4, which outyields Deutsch Evern by up to 30% and matures earlier and has larger fruits. It is, however, highly sensitive to frost with the result that it has to be cultivated in cold frames. A new virus-free strain of Deutsch Evern has also been developed at Zaltbommel.

3761 KOLBE, M. H.
On-the-farm strawberry variety trials.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 254–57.

In trials of 35 varieties during 1950–54 in West Virginia, Fairland, Vermilion, Robinson and Catskill gave outstandingly good results.

3762 MOULTON, J. E. & JOHNSTON, S.
Techniques used in strawberry breeding in Michigan.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 243–45.

Information is given on the temperature and light treatments applied to plants in the greenhouse prior to crossing, the techniques used for emasculation and crossing, and procedures adopted in selecting the seedlings in the field in breeding at the Michigan Agricultural Experiment Station. By means of the treatments described the seedlings can be brought into bearing and selections made 18 months after crossing.

3763 MOULTON, J. E. & JOHNSTON, S.
The breeding value of 35 strawberry varieties tested in Michigan.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 246–53.

"Of the 35 varieties and selections tested for breeding value in Michigan, Premier, Redcrop, Sparkle, Tennessee Shipper, Midland, Fairland, and Marshall gave a high percentage of promising progeny. Selections derived from Tennessee Shipper crossed with Fairland were particularly outstanding." [Authors' summary].

3764 SMEETS, L.
Influence of the temperature on runner production in five strawberry varieties.
Euphytica, Wageningen 1956 : **5** : 13–17.

The number of runners produced and the duration of runner production increased with temperature in Deutsch Evern, Oberschlesien, Auchincruive Climax and Jucunda grown at 17°, 20°, 23° and 26° C.; in Madame Moutot, 20° C. was the most effective temperature.

3765 GERŠATER, T.
(A strawberry cropping twice in the environment of Moscow).
Priroda (Nature), Leningrad 1956 : No. 5 : p. 126. [Russian].

Reference is made to the ever-bearing variety Ada, with large fruits ripening in July and then again in August. The size of the fruits was improved by growing it close to large-fruited pollinators such as Laxton and Krasavica Zagorjja [Ultramontane Beauty]. Incidentally this also caused variability in fruit shape among the first fruits.

3766 Downs, R. J. & Piringer, A. A.
Differences in photoperiodic responses of everbearing and June-bearing strawberries.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 234–36.

The June-bearing varieties Howard 17, Klondike and Climax and everbearing strawberries Gem, Mastodon and Red Rich were exposed to photoperiods of 11, 13, 15 and 17 hours at the University of Minnesota. The main differences found between the responses of the two types of varieties have already been briefly reported (cf. Abst. 227). The present paper also describes minor varietal differences in photoperiodic response within each type.

3767 Reid, R. D. & Wood, C. A.
Fruit variety trials. III. Initial trials of Talisman and other Auchincruive strawberry selections.
Scot. Agric. 1956 : **35** : 213–18.

The authors deal chiefly with the new red-core resistant strawberry variety Talisman, basing their account of it on observations made in trials at Mylnefield and Auchincruive, Scotland (cf. Abst. 687).

3768 Chao, C.-Y.
Microsporogenesis of certain edible bananas.
Taiwania 1955 : No. 6 : 67–78.

Meiosis in the three Taiwan varieties Fen [Mealy] (*Musa cavendishii*) and Pei [Northern] and Hsien Jen [Immortal] (*M. sapientum*) is described. All three varieties are triploid ($2n = 33$) but the frequency of trivalents is low. The average numbers of univalents in the three varieties were 5·57, 2·94 and 13·80, respectively. The cytological data cast doubt on the supposition that Hsien Jen is a mutant of Pei.

3769 Ramakrishnan, T. S. & Damodaran, S.
Observations on the wilt disease of the banana.
Proc. Indian Acad. Sci. : Sect. B. : 1956 : **43** : 213–22.

The investigations reported included a study of varieties commonly grown in Madras State with respect to their reaction to wilt (*Fusarium oxysporum* var. *cubense*). Moongil, Poovan, Peyladen, Rajabalo and Vamanakeli remained free from infection. Pot testing gave a more satisfactory evaluation of varietal response than testing under wet field conditions. Strains of the pathogen were distinguished.

3770 Breider, H.
Die Bedeutung der geschlechtlichen und ungeschlechtlichen Vermehrung. (**The significance of sexual and nonsexual propagation**).
Umschau 1956 : **56** : 359–60.

Degeneration of vegetatively propagated vines is regarded as the result of the perpetuation of undesirable somatic mutations, which occur at a rate of 3–15%; with sexual propagation undesirable mutants may be eliminated during sporogenesis, fertilization or zygotic or later development, so that degeneration does not take place.

3771 Cosmo, I. & Polsinelli, M.
"Garganega".
Ann. Sper. agr. 1956 : **10** : No. 3 : Suppl. : cxv–cxxv.

The identity of the vine of this name, which has been much confused in the past, is discussed and the vine held to be typical of the variety is described and illustrated. It is an important variety for wine making in the Vicenza and adjacent provinces of northern Italy.

3772 Bruni, B.
"Verdicchio bianco". (**White Verdicchio**).
Ann. Sper. agr. 1956 : **10** : No. 3 : Suppl. : xi–xx.

The vine of this name is the best variety grown for wine making in the Italian region of the Marches and is described.

3773 Bruni, B.
"Nuragus".
Ann. Sper. agr. 1956 : **10** : No. 3 : Suppl. : i–ix.

The vine of this name, thought to be the most ancient of the vines grown in Sardinia, possibly having been brought there by the Phenicians, is described and illustrated. It produces a wine of good quality and grows in very inhospitable soils.

3774 Basteleus, R.
De meilleures vignes, grâce à une sélection vigoureuse! (**Better vines, thanks to a vigorous selection!**)
Courr. hort. 1956 : **18** : p. 86.

A popular account of the procedure followed at the La Hulpe station, Belgium, in the selection and vegetative propagation of glasshouse grapevines producing fruit of superior quality is given.

3775 PEYER, E.
Die Züchtung neuer Rebsorten an der Eidg. Versuchsanstalt in Wädenswil. (**The breeding of new grape varieties at the Federal Research Station at Wädenswil**).
Schweiz. Z. Obst- u. Weinb. 1956 : **65** : 214–17.

This popular account of the principles of grape breeding includes general information on recent research at Wädenswil, Switzerland. Attempts are being made to breed a red-wine variety equal in quality to Blauer Burgunder [Blue Burgundian] but maturing somewhat earlier.

3776 EVANS, E. P. & CARSTENS, W. C.
A new grape variety for the market.
Fmg. in S. Afr. 1956 : **32** : No. 1 : 23–25.

The problem of breeding an early grape variety combining high yielding capacity, resistance to anthracnose and cracking after rain, and fruits with satisfactory lustre, size and flavour is discussed with reference to the initial results of hybridization, mostly between European and American varieties, at the Horticultural Research Station, Roodeplaat, near Pretoria, S. Africa. The European varieties Queen of the Vineyard, Muscat Hamburgher, Crystal and the American varieties Isabella and Catawba are mentioned as promising parents. Hybridization of Kenka, a hybrid variety, with Catawba has given encouraging results but the vigorous anthracnose-resistant seedlings obtained require further improvement with respect to bunch and fruit size.

3777 POENARU, I.
Hibrizi noi de viţa de vie. (**New hybrids of wine vines**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 575–78.

A short account of hybrids that have been raised in Rumania and are of potential value for wine making is given.

3778 LOLADZE, V. P.
(**A variety of Saperavi**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 2 : 30–33. [Russian].

A new form of vine producing red wine of a higher quality than that from the common variety of Saperavi has been selected among Kahetian material. It is distinguished from the common variety mainly by the elongate berries resembling those of Budešuri Tetri, and greater earliness and productiveness.

3779 CAPRIA DE FLEITAS, M. H. & VEGA, J.
Estudio de algunos caracteres ampelométricos desde el punto de vista de la diagnosis varietal. (**Study of some ampelometric characters from the point of view of varietal diagnosis**).
Rev. Invest. agríc., B. Aires 1956 : **10** : 49–64.

Ampelographic measurements made on the leaves of a number of Argentine vine varieties showed significant differences both within and between varieties. The values varied also in different years and are therefore considered to be only of relative significance for diagnostic purposes.

3780 HAČATRJAN, S. S.
(**The inheritance of sex in hybrid seedlings of the vine**).
Agrobiologija (Agrobiology) 1956 : No. 2 : 119–22. [Russian].

At Erevan, varieties with ♀ flowers such as Sev Aĭgeni, Muskat Fioletovyĭ [Mauve Muscat] and Malingre Seedling were fertilized by *Vitis amurensis*, with ♂ flowers, and by several varieties with perfect flowers. One of the parents was cut back before crossing in order to improve its vigour. Analyses of the hybrids that have reached the flowering stage suggest that the crosses with *V. amurensis* (the latter cut back) gave mainly progenies bearing ♂ flowers and conversely, when the seed parent was cut back, progenies with a higher percentage of ♀ and perfect flowers were obtained. Analogous results are reported with the hybrids from varieties with perfect flowers. Data on the effect of cutting back upon the seed setting and seed viability of the hybrids are also provided.

3781 NASTEV, D.
(**Studying the capacity for fertilization of some of our own and foreign varieties of vines**).
God. Zborn. zemjod.-šumarsk. Fak. Univ. Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje)/Ann. Fac. Agric. Sylvicult. Univ. Skopje : Zemjod. : 1952/53 & 1953/54 (1955) : **6–7** : 263–75. [Macedonian].

Pollen and flower analyses of the principal varieties grown in Macedonia have shown that all, except Čuaš and a group of Drenak [Rhazaki] varieties, are self fertile with perfect flowers and viable pollen. The others are self sterile.

3782 Bertuzzi, A. & Cosmo, I.
Gli ibridi produttori ed i succhi di uva. (**Direct producer hybrids and grape juices**).
Riv. Vitic. 1956 : **9** : 119–22.

The writer expresses the view that direct-producer hybrids produce better fruit juice than do the best wine-making varieties. I. Cosmo in his reply does not entirely agree with this opinion.

3783 Nastev, D.
(**A study of vine varieties from the Macedonian People's Republic**).
God. Zborn. zemjod.-šumarsk. Fak. Univ. Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje)/Ann. Fac. Agric. Sylvicult. Univ. Skopje Zemjod. : 1951/52 : **5** : 263–300. [Macedonian].

Detailed botanical and economic descriptions of old Macedonian wine and dessert varieties are given. Since the advent of *Phylloxera* the area under all these varieties, except Prokupec and Plovdina, which are notable for high yield, has been greatly reduced in favour of Dattier de Beyrouth, Chasselas and other introduced varieties. However some of the old Macedonian vines, for instance Stanušina, Ohridsko Crno [Ohrid Black], Crno Tikveško [Tikveš Black], Guševica and Drevenik are valuable on account of their regular annual yield, moderate soil and moisture requirements and disease resistance.

3784 Aliev, A. M.
(**The prospects of progress in viticulture in Dagestan**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 5 : 65–67. [Russian].

The article mentions the growing importance of Dagestan as a producer of dessert grapes. In addition to the principal varieties, which are listed, there are to be found old local varieties such as Ėmček Izjum [Ėmček Raisin] and Ag Ėmček [White Ėmček]. These are high-yielding midseason types producing large well-shaped grapes. Ėmček Izjum is distinguished by a fine flavour resembling muscat grapes. Work on the improvement of flavour of Agadai is reported from the Dagestan research station. Apart from indifferent flavour it is a fine dessert variety, especially valuable for its good transportability.

3785 Negreanu, E. & Lăzărescu, V.
Anomalii florale apărute la vița de vie în anul 1954. (**Floral anomalies that appeared in vines for wine-making in the year 1954**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. **3** : 579–83.

Data are provided on the incidence of floral damage due to unseasonable low temperature during spring in 1954 in the principal Rumanian varieties.

3786 Cosmo, I., Comuzzi, A. & Rubin, V.
Indagini sulla ricostituzione viticola delle Venezie ai fini dell'orientamento per i futuri impianti. Risultati della sperimentazione compiuta sui vitigni Europei da vino e sui portinnesti in provincia di Padova a decorrere dal 1926. Primo contributo e secondo contributo. Zona dei Colli Euganei: sottozona dei terreni molto clorosanti. Terzo contributo. Zona dei Colli Euganei: sottozona dei terreni poco o niente clorosanti. (**Investigations on the viticultural reconstruction of the Venetian provinces with the object of providing guidance for future planting. Results of experiments carried out on European wine grapes and on rootstocks in the province of Padua from 1926 onwards. I and II. Colli Euganei zone, subzone of soils with a high tendency to produce chlorosis. III. Colli Euganei zone, subzone of soils producing little or no chlorosis**).
Ann. Sper. agr. 1956 : **10** : 289–320, 373–402, 783–812.

The observations show that in soils where the amount of $CaCO_3$ exceeded 50% the only vine that could be used as a rootstock without the occurrence of excessive chlorosis was Berl. x Rup. 140 Ruggieri.

In the third subzone the best rootstock is Teleki, the varieties of wine grapes recommended being Merlot combined with Raboso veronese in the plains and Garganega with Sauvignon on higher ground.

3787 Barrett, H. C.
Black rot resistance of the foliage on seedlings in selected grape progenies.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 220–24.

The reactions of 37 parental varieties, comprising 8 French hybrids, 12 American hybrids, 12 representative of *Vitis vinifera* and 5 wild selections of *V. cinerea* and *V. cordifolia*, to black rot (*Guignardia bidwellii*) were determined at the University of Illinois, Urbana. In general, the results from tests by artificial inoculation and natural infection corresponded. The group of wild selections was the most resistant. The *V. vinifera* group was almost completely susceptible. The American-hybrid group were more resistant than the *V. vinifera* group but more susceptible than the French hybrids. Data on the reactions of artificially-inoculated young seedlings from 48 F_1 crosses indicated that resistance is controlled by multiple factors. The *V. cinerea* clones and American hybrid Mills are noteworthy as parents giving progeny with a relatively high degree of resistance.

FORESTRY

3788 MATTHEWS, J. D.
The improvement of forest trees by selection and breeding.
Biology 1956 : **21** : No. 3 : 30–38.

In this outline of the aims and methods of forest-tree breeding, examples are given, chiefly from European work, of the results of the selection and propagation of trees with desirable qualities, interspecific and intraspecific hybridization, the utilization of hybrid vigour, the occurrence and use of polyploids and the artificial induction of mutation.

Report of the Forestry Commission on Forest Research for the year ended March, 1955 (1956) : Pp. 140.

3789 *Lines, R. Provenance experiments. (pp. 35–36).*

Lodgepole pine. Trees of coastal provenance generally have many more shoots and are therefore more bushy in habit than those of inland provenance.

Sitka spruce. Material from Queen Charlotte Islands, BC, and from Northumberland (the latter originally from Queen Charlotte Islands seed) were significantly less affected by frost and discoloration than trees originating from Washington, USA.

Douglas fir. Although trees from the interior of British Columbia, planted at Glentress, Peebles, tend to be of a paler green colour than those from Vancouver Island, the difference between the provenance types was not statistically significant. Material of inland provenance was less heavily infested with adelgids than coastal material but was more susceptible to *Rhabdocline pseudotsugae.*

3790 *Peace, T. R. & Jobling, J. Poplars. (pp. 43–46).*

Testing of clones for resistance to bacterial canker has continued and new varietal trial plots have been established.

3791 *Matthews, J. D. & Mitchell, A. F. Forest genetics. (pp. 46–49).*

Numerous woodlands and plantations have been surveyed and assessed as seed sources for current and future planting and the selection, testing and propagation of plus trees for breeding continued. Further seed orchards containing clones of plus trees of Scots pine, larches, Douglas fir and beech have been established. At Alice Holt, Hants., seed of *Pinus banksiana* x *P. contorta* has been sown. Intraspecific and interspecific hybridization of larch was continued on a small scale.

3792 JOHNSSON, H.
Årsberättelse över föreningens för växtförädling av skogsträd verksamhet under 1955. (**Annual report on the activities of the Association for Forest Tree Breeding during 1955).**
Årsberätt. För. Växtf. Skogstr. 1955 : 3–18.

Ekebo Station

Trials have been established of progenies from (1) crosses between Swedish pines and pines of German and Swiss provenance; (2) crosses among continent spruces, between continent and Swedish spruces, between normal spruces and serpentine spruces and between *Picea abies* on the one hand and *P. asperata*, *P. omorika* and *P. mariana* on the other; and (3) the crosses *Larix leptolepis* x *L. decidua*, *L. sibirica* x *L. decidua*, *L. gmelini* x *L. leptolepis*, *L. gmelini* x *L. decidua*, *L. olgensis* x *L. decidua* and *L. laricina* x *L. decidua*.

Four curly-grained and four straight-fibred familes of birch have been obtained from the cross *Betula japonica* x *B. verrucosa*. Two triploids have also been produced, the pollen parent being a diploid *B. verrucosa* and the respective female parents colchicine-induced tetraploids, one of *B. verrucosa* and the other of an F_1 hybrid of *B. verrucosa* x *B. japonica* (cf. Abst. 3810). Work on alders includes the study of diploid and experimentally induced triploid and tetraploid forms of *Alnus glutinosa* and diploids and triploids from *A. glutinosa* x *A. rubra*; the pollen parent of the triploid hybrid is 4*n* *A. glutinosa*.

Brunsberg Station

Of the hybrids *Populus tremula* x *P. tremuloides*, *P. tremuloides* x *P. davidiana* and *P. tremula* x *P. davidiana*, undergoing trial at Gårdsjö and Edane, the last-mentioned has proved very vigorous in the nursery.

During the first summer of progeny and provenance tests, hybrids between spruces from Värmland and Germany proved markedly superior to hybrids among Värmland spruces, considerable differences between progenies from different ♂ and ♀ parent trees being found in both types of hybrid. Only small families were obtained from the crosses *Picea abies* x *P. asperata* and *P. abies* x *P. glauca*, interspecific cross fertility being low. Self fertility in spruce was also low. A census of plus-tree stands of spruce in Dalsland has been completed.

Sundmo Station

Crosses between pines of the same and of different provenance have been effected, grafted trees being used as female parents. Thirteen clones have been selfed. In an attempt to break down the sterility barrier between Swedish *Pinus sylvestris* ♀ and *P. murrayana* ♂, the Russian method of pollinating with a mixture of pollen from the two parents has been employed.

3793 HOUTZAGERS, G.
Veredeling in de bosbouw. (**Breeding in forestry**).
StudKring. PlantVeredel. Wageningen. Versl. 1955 : **45** : 605–13.

A survey of forest-tree breeding in recent years both in the Netherlands and elsewhere is given. It is pointed out that forest-tree breeding differs essentially from the breeding of crop plants in that the time factor is a far greater handicap. The selection and vegetative propagation of plus trees, interspecific hybridization and the exploitation of heterosis offer the best means of improving both the yield and the quality of forest trees. In the case of pine, some 60 plus trees have been selected in the Netherlands.

3794 QUERENGÄSSER, F.
Über Provenienz-, forstgenetische und forstzüchterische Arbeiten in Nordamerika. (**Provenance studies and work on forest-tree genetics and breeding in North America**).
Mitt. dtsch. dendrol Ges. 1953/54 : No. 58 : 71–99.

Work on the selection, hybridization and polyploidization of forest trees at various experimental stations in the USA and Canada is surveyed, special attention being paid to interspecific hybridization of pines, elms and poplars and the development of disease resistance in elms and white pines. The author compares forest-tree breeding work in North America and Germany, suggests that German research workers should cooperate more closely with their opposite numbers in North America and makes several suggestions as to ways in which research workers at home could benefit from American experience in certain spheres.

3795 WRIGHT, J. W.
Summary of tree-breeding experiments by the Northeastern Forest Experiment Station 1947-1950.
Pap. NE For. Exp. Sta. 1953 : **56** : Pp. 47.

The results of breeding work on *Acer* spp., *Fraxinus* spp., *Liriodendron* sp., *Quercus* spp., *Abies* spp., *Picea* spp. and *Pinus* spp. are given and several new pollination techniques recently devised at the above station, which is situated at Upper Darby, Pa., are described. Interspecific crosses within the genus *Acer* were highly successful; the F_1 progenies of *A. platanoides* x *A. cappadocicum* and of *A. negundo* x *A. henryi* displayed marked hybrid vigour. The cross *F. pennsylvanica* x *F. velutina* and its reciprocal gave very high seed sets; no evidence of hybrid vigour has been observed as yet. Interspecific crosses within the genus *Quercus* gave low seed sets; the most successful crosses carried out were between *Q. borealis* and *Q. velutina*; the hybrids did not surpass their parents in vigour. Interspecific crosses in *Picea* mostly failed but good seed sets were obtained with *P. abies* x *P. asperata*, *P. montigena* x *P. abies* and *P. montigena* x *P. asperata*. A large number of crosses within the genus *Pinus* proved successful. *P. griffithii* x *P. strobus* and the reciprocal gave rise to hybrids superior to both parents in growth rate. The F_1 of *P. strobus* x *P. flexilis* were intermediate between the two parent species for most characters.

3796 BOUVAREL, P.
Génétique forestière et amélioration des arbres forestiers. (Première Partie.) (**Forestry genetics and forest-tree breeding. Part I**).
Bull. Soc. bot. Fr. 1956 : **103** : 35–74.

An historical account and bibliographical review are presented of progress achieved in the breeding of forest trees, mainly in Europe, since the eighteenth century. Among the subjects discussed are the study of races and provenance types, the selection of plus trees, interspecific hybridization, vegetative multiplication and the setting up of seed nurseries.

3797 RAO, H. S.
Chromosome numbers in forest plants.
Indian For. 1954 : **80** : 551–52.

The following chromosome numbers, established at the Forest Research Station, Dehra Dun, India, are recorded: *Ageratum conyzoides*, $2n = 20$; *Bauhinia galpini*, $n = 18$; *Butea monosperma* (= *B. frondosa*), $n = 9$; *Byrsonima crassifolia*, $n = 14$; *Casimiroa edulis*, $2n = 18$;

Castanospermum australe, $n = 13$; *Chloroxylon swietenia*, $n = 10$; *Diospyros peregrina* (= *D. embryopteris*), $n = 15$; *Erythrina blakei*, $n = 21$; *Hovenia dulcis*, $n = 12$; *Hydnocarpus kurzii* (= *Taraktogenos kurzii*), $n = 12$; *Lagerstroemia floribunda*, $n = 24$; *L. speciosa* (= *L. flos-reginae*), $n = 24$; *Moringa oleifera* (= *M. pterygosperma*), $n = 14$; *Portulaca grandiflora*, $n = 9$; *Rhus viminalis*, $n = 12$; *Shorea robusta*, $2n = 14$; *Solanum wightii* (= *S. macranthum*), $2n = 12$; *Tectona grandis*, $2n = 24$; and *T. hamiltoniana*, $n = 12$.

3798 SATO, Y. & MUTO, K.
On the viability of forest tree pollen.
Hokkaido Dagaku Nogakubu Enshurin Kenkyu Hokoku/Res. Bull. Coll. Exp. For. Hokkaido Univ. 1955 : **17** : 967–79.

Pollen storage and germination were studied in *Alnus glutinosa* and three *Betula* spp. The optimum storage temperature was –8° C. Vacuum storage or storage in a sealed bottle with Adsol and K_2S prolonged viability. For germination, a sucrose concentration of 10–15% and a temperature of 20° C. are recommended.

3799 KÁRPÁTI, Z.
Dendrológiai jegyzetek. VI. (**Dendrological notes. VI**).
Agrártud. Egy. kert- szőlőTud. Kar Évkön. 1951/2 (1953) : **2** : No. 2 : 81–88.

The discovery of the hybrid *Sorbus rotundifolia* (*S. aria* s.l. x *S. torminalis*) in the Bükk mountains is reported. In addition, descriptions are given of Hungarian forms and varieties of *Euonymus verrucosa*, *Carpinus betulus* and *Fagus sylvatica*.

3800 KRAUSS, G. A.
Zur Frage der forstlichen Standortsrassen. (**On the question of local races of forest trees**).
Forstwiss. Zbl. 1952 : **71** : 349–59.

The author discusses the role of natural selection and environment in the development of local races of forest trees and mentions the more important ecotypes of pine, fir, spruce, beech and alder found in Germany. The importance of local races in forest-tree breeding is stressed with reference to the destruction of many local stands in the war and postwar periods.

3801 STERN, K.
Rassenbildung und Bestandesanerkennung. (**Race formation and recognition of forest-tree stands**).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 5–14.

The terms population, race and variety as applied in forest-tree genetics are defined and ways in which a race may be evolved as the result of selective pressures, mutations, geographic isolation, inbreeding, genetic drift, the immigration of new genotypes or pollen dispersal are described. The author is of the opinion that the existing German legislation concerning the control of forest-tree seed, which stipulates that seed should be obtained from the same climatic zone as that in which it is to be planted and restricts the certification of local stands for seed production to a given area, is based upon sound genetical principles as it is to be expected that selective pressures in a given area will have resulted in the development of genotypes adapted to that area.

3802 KÁRPÁTI, Z.
A barkócafa-*Sorbus torminalis* (L.) Cr. alakváltozatossága. [**The variability of the wild service tree, *S. torminalis* (L.) Cr.**].
Agrártud. Egy. kert- szőlőTud. Kar Évkön. 1951/2 (1953) : **2** : No. 2 : 11–46.

Thirty-five distinct forms of *S. torminalis* occurring in Hungary are described, the distinctions being based mainly on differences in leaf shape but also on size and shape of the fruit and form of the tree. The range of variation in Hungary is as great as that in south-east Europe and the Near East, hitherto regarded as the centre of variation and speciation of the Pomoideae. It is not clear whether Hungary is to be regarded as a western extension of the area of origin or as a secondary centre of variation arising through hybridization of *S. torminalis* with the highly variable *S. aria* complex, which also occurs in Hungary.

3803 NAKAMURA, K.
Vererbung von Eigenschaften der Mutterbäume. Über den Einfluss des Alters der Mutterbäume auf die Nachkommenschaften. (**Inheritance of the properties of mother trees. On the influence of the age of the mother trees on the progenies**).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 85–86.

The growth rates of specimens of *Cryptomeria japonica* grown from seed of trees that were 600, 100–350 and 13 years old respectively were compared at Tokyo University. Cones and seeds obtained from trees belonging to the third group were heavier than those from trees in the other two groups. In the first two years, the growth rate of trees belonging to the third group was the most rapid, at the end of six years all trees were of approximately the same height but, after twenty years, trees belonging to groups 1 and 2 were considerably taller than those of group 3. Trees of group 3 began to flower as early as the third or fourth year but those of the other two groups did not flower until considerably later.

3804 RYBIN, V. A. & ILJIN, A. G.
(Early fruiting in *Quercus pedunculata*).
Priroda (Nature), Leningrad 1956 : No. 4 : 114–15. [Russian].

In the Crimea some seedlings of *Q. pedunculata* were notable for quick rate of growth and some flowered in the fourth or fifth year. A five-year old seedling bearing only ♀ flowers, when fertilized by pollen of *Q. petraea*, produced acorns from which seedlings are being raised.

3805 VASCONCELLOS, J. DE C. E & FRANCO, J. DO A.
Carvalhos de Portugal. (**The oaks of Portugal**).
An. Inst. sup. Agron., Lisboa 1954 : **21** : 1–135.

Various defects of previous systems of classification of the Portuguese oaks are referred to, one of them being the failure to take into account the existence of a large number of interspecific hybrids. These include *Quercus pyrenaica* x *Q. robur*, *Q. canariensis* x *Q. faginea*, *Q. faginea* x *Q. robur*, *Q. faginea* x *Q. pyrenaica*, *Q. ilex* ssp. *rotundifolia* x *Q. suber* and *Q. coccifera* x *Q. ilex* ssp. *rotundifolia*. The characters used in the present classification include features of the growing tree, leaves, flowers and fruits. A key is provided and is followed by full descriptions of the species regarded as valid, with indications of synonyms and vernacular names, illustrations of the leaves and details of distribution.

3806 JOACHIM, H. F.
Probleme der Pappelforschung. (**Problems of poplar research**).
Arch. Forstw. 1954 : **3** : 487–502.

The systematics, yield, timber quality and uses, diseases, culture and breeding of poplars in Europe are surveyed. Early breeding work has been concerned chiefly with heterosis but selection of open pollinated seedlings and hybridization of desirable phenotypes have also been of importance. Marked differences occur among poplars of differing provenance, both in photoperiodic response and resistance to frost, pests and diseases. The chief aims of breeding are desirable form, timber and growth rate and resistance to fungal and insect parasites.

3807 HARA, M. & TANAKA, K.
(On the growth of poplar hybrids introduced from the USA).
Tottori Nogaku Kai Ho/Trans. Tottori Soc. Agric. Sci. 1955 : **10** : 30–33. [Japanese].

Growth rates for cuttings of 10 hybrids are reported. The most rapid growth was in a hybrid referred to as *P. charkowiensis* x *P. candina*.

3808 VAN VLOTEN, H.
Jeugdgroei van nakomelingschappen uit kruisingen met Leuce-populieren, een generatieve toetsing van daarbij gebruikte ouders. (**Juvenile development of progenies from crosses between poplars of the section *Leuce*, a progeny test of the parents used**).
Korte Meded. Proefst. Bosbouw TNO 1954 : No. 22 : Pp. 7.

Data are presented on the growth rate and tree shape of the F_1 progenies of intraspecific and interspecific crosses carried out at the TNO Forestry Research Station "De Dorschkamp", Netherlands. The results of crosses between specimens of *Populus tremula* of Netherlands origin were disappointing but crosses between trees of Netherlands and Polish origin have given good results. *P. tremula* pollinated with pollen of *P. tremuloides* of North American origin gave rise to hybrids with a good growth rate. The F_1 of *P. alba* ♀ x *P. tremula* ♂ also proved promising and was, in addition, highly resistant to rust. Hybrids obtained by pollinating *P. alba* with pollen of *P. tremuloides* from North America also grew well but the shape of the stems was poor.

3809 Verslag van het onderzoek naar de populierenkanker in 1952 en 1953, veroorzaakt door *Pseudomonas syringae* v. Hall f. sp. *populea* Sabet. (**Report of research on poplar canker caused by *P. syringae* v. Hall. f. sp. *populea* Sabet, in 1952 and 1953**).
Meded. ned. Heidemaatsch. 1955 : No. 21 : Pp. 19.

A wide range of species and interspecific hybrids were inoculated at the Phytopathology Laboratory, Baarn, Netherlands, with infected slime from *Populus tremula*. Of the species thus inoculated, *P. nigra*, *P. nigra* var. *italica*, *P. regenerata*, *P. serotina* var. *erecta*, *P. deltoides* var. *missouriensis* and *P. robusta* 'Welte 1' were resistant or semiresistant. Of the NHM series of interspecific hybrids, NHM 46, 57, 60, 70, 104, 105 and 116 proved highly resistant.

The best results in interspecific crosses were obtained when either *P. nigra* or *P. nigra* var. *italica* was used as one of the parents.

3810 Johnsson, H.
Auto- and allotriploid Betula-families, derived from colchicine treatment.
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 65–70.

At the Forest Tree Breeding Institute, Ekebo, Källstorp, Sweden, treatment of seeds of *B. verrucosa* and of an F_1 hybrid between *B. japonica* ♀ and *B. verrucosa* ♂ with a 0·2% colchicine solution for three weeks gave tetraploid individuals characterized by large leaves with coarse serrations, large fruits and bracts, a slow growth rate and, in many cases, an abnormal habit caused by excessive branching. The pollen grains of the tetraploids were larger than those of the diploids; they were fertile but the fruit set was lower than in the diploids. When pollinated with pollen of 2*n* *B. verrucosa*, the C_0 trees gave rise to triploid progenies with a normal growth habit but slightly shorter and thicker in diameter than the diploids. A few aneuploid individuals were observed.

3811 Richens, R. H.
Elms.
New Biol. 1956 : No. 20 : 7–29.

A popular account is given of the taxonomy and history of *Ulmus* spp. with special reference to English elms.

3812 Molina Rodríquez, F.
On the genetic improvement of *Pinus pinaster* Sol.
Transl. NZ For. Serv. undated : Pp. 10.

A translation of an article dealing with methods employed in breeding *P. pinaster* in Spain is provided; this species is of considerable importance to the economy of Spain and the principal breeding aims include improved yields of turpentine and wood, straight trunks and reduced branching. Natural selection in different parts of the Iberian Peninsula has led to the development of an extensive range of ecological races differing widely in morphological and physiological characteristics and has in many cases favoured the evolution of genotypes with crooked stems. The first measures proposed include the making of an inventory of all ecological races in the Iberian Peninsula. Élite trees would be used for seed collection and exempted from felling. Highly promising specimens would be propagated vegetatively and seed nurseries established; in this context several techniques of grafting and rooting cuttings of *P. pinaster* that have proved successful in Spain are outlined. So far the highest turpentine yields have been obtained from trees in the area around Valladolid and Segovia. In conclusion, the author mentions the possibility of interspecific hybridization involving *P. pinaster*.

3813 Jansen, E. C. & Broekhuizen, J. S. van
Selectie van de groveden (*Pinus sylvestris* L.). [**Selection of Scots pine (*P. sylvestris* L.)**].
Ned. BoschbTijdschr. 1952 : **24** : 289–303.

Work carried out during 1949–51 by the Netherlands Committee for the Selection and Improvement of Scots Pine is described. The activities of this organization consist in classifying stands over 25 years old that contain upwards of 30% of plus trees, the principal criterion used in these assessments being stem form. Suitable stands have been registered for seed collection and, in addition, a number of trees of exceptional quality are being propagated vegetatively. The breeding programme aims at improvements in the straightness of the stems, increased height and a broad crown.

3814 Barber, J. C., Dorman, K. W. & Jordan, R. A.
Slash pine crown width differences appear at early age in 1-parent progeny tests.
Res. Notes SE For. Exp. Sta. 1955 : **86** : Pp. 2.

Recent measurements of seedlings in 1-parent progeny tests of slash pine carried out by the Southeastern Forest Experiment Station, Asheville, North Carolina, revealed distinct differences in crown width between different lots of seedlings. A positive correlation was also established between crown type and the height and width of the seedlings, trees with broad crowns being taller than those with narrow crowns.

3815 Mergen, F.
Selection and breeding of long-leaf pine.
Nav. Stores Rev. 1953 : **63** : No. 7 : 12–14, 23–26.

A brief summary of work at the Southeastern Forest Experiment Station, Lake City, Fla. and at the Olustee Experimental Forest is given. Selection began in 1941 when a total of 12 trees that produced at least twice as much gum as the average tree of the same diameter growing on the same site were located in Georgia and

Florida; these trees were propagated vegetatively and intercrossed. Later selection was concentrated on fast growth rate and good tree form. In addition, crosses were effected in 1953 between slash pine and longleaf pine, and between loblolly pine and slash pine with a view to exploiting hybrid vigour.

3816 Scheplitz, B.
Über einen natürlichen Abies-Bastard. Morphologische und holztechnologische Untersuchung an Artbastarden von *Abies concolor* x *Abies grandis*. (**On a natural *Abies* hybrid. Study of the morphological and technological characteristics of the wood of interspecific hybrids of *A. concolor* x *A. grandis***).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 71–79.

A. grandis and *A. concolor* are compared and it is concluded, from a study of their morphological characters, that the two species are closely related. Seed obtained from an open-pollinated stand of *A. concolor* pollinated with pollen from trees belonging to Formenkreis II or IV of *A. grandis* gave rise to plants displaying heterotic vigour, capable of growing on poor soils and possessing a high degree of resistance to frost and drought. The 29 hybrids studied inherited morphological characteristics from both parents and, in respect of colour and shape of needles and cones, were largely intermediate between the two parent species. Crossing with *A. concolor* did not, however, have any detrimental effect on wood quality, the technological properties of the wood of the hybrids being equal to those of *A. grandis*.

3817 Tesdorff, H.
Kreuzungsversuche mit *Araucaria araucana* (Molina) K. Koch und *Araucaria angustifolia* (Bertoloni) O. Ktze. [**Experiments on crossing *A. araucana* (Molina) K. Koch and *A. angustifolia* (Bertoloni) O. Ktze.**].
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 79–84.

Crosses in both directions were carried out between the above two species with a view to combining the rapid growth of *A. angustifolia*, a species found at a latitude of 26° in the subtropical Misiones territory, Argentina, with the timber qualities of *A. araucana*, which grows in the colder Neuquéry territory at a latitude of 39°. The seedlings inherited the morphological characteristics of the maternal parent, irrespective of the direction in which the cross was carried out. The progeny of the cross *A. angustifolia* x *A. araucana* were the more vigorous and grew more rapidly than the progeny of the reciprocal. It is hoped to obtain from these crosses trees suitable for wide-scale cultivation in central Argentina at a latitude of approximately 32°.

3818 Wright, J. W.
Species crossability in spruce in relation to distribution and taxonomy.
For. Sci. 1955 : **1** : 319–49.

The author describes the results of experiments on artificial hybridization of *Picea* spp. Considering his own results in conjunction with those of other investigators, he refers to 70 different attempted interspecific crosses, exclusive of reciprocals. Combination of data on crossability, geographical distribution and morphological features has led the author to suggest the following hypotheses of the evolution of the genus. *Picea* had a monophyletic origin and the basic type has undergone relatively little change in the course of speciation. Mutations have occurred at many loci but few allelic series have been established and interactions between genes have remained weak. The genus originated in north-eastern Asia, whence it spread along boreal routes and southwards along mountain chains. The southern species, compared with the northern, have smaller geographical ranges, many of which are decreasing at the present time. Genetic uniformity and specialization for survival in southern habitats, together with a smaller capacity for evolutionary change than the associated competing angiosperms, have contributed to this diminution in range. Barriers to interspecific crossing have arisen mainly from genic differentiation subsequent to speciation due to geographical isolation. Introgression has been observed in certain regions and probably played a significant role in evolution during the past. The species are divided into groups according to their putative relationships.

3819 Eiche, V.
Spontaneous chlorophyll mutations in Scots pine (*Pinus silvestris* L.).
Medd. SkogsforsknInst. Stockh. 1955 : **45** : No. 13 : 1–64.

A detailed study of chlorophyll mutants in the progenies of trees from stands in 77 localities in Sweden, 11 in Norway, 8 in Germany and 1 in the Netherlands is presented. Two classes of mutant were distinguished, one consisting of seedling mutants (a) and the other of plants in which the chlorophyll deficiencies were not apparent until after the seedling stage (b). Four and five types of chlorophyll defect were recognized in classes (a) and (b) respectively. Mother trees differed widely in the proportion of mutants they produced, between 60 and 70% of the trees giving no mutants. Of the mutant-producing trees, about 70% gave rise to mutants of class (a) only, 20% to class (b) and 10% to both classes. The *xanthoviridis* deficiency type was the most frequent. Trees with a high mutation rate tended to produce a higher proportion of *xantha* and *albina* types than those with a lower rate. Most mother trees produced only one deficiency type, some produced two and a few three or four. Evidence was obtained that mutant seeds are more liable than normal seeds to germinate poorly under adverse conditions. Differences in mutation rate occurred between stands, 50–75% of the stands showing a rate of 0–2 per thousand, 20–40% a rate of 2–6 and 5% a rate of more than 6. While the *xanthoviridis* type of deficiency was almost equally distributed throughout the Scandinavian stands, the frequency of the *xantha* type was highest in the south and decreased northwards and the frequency of *viridis* showed the reverse tendency.

3820 Priehäusser, G.
Über den Formenkreis der Fichte in ursprünglichen Beständen des Bayrischen Waldes nach den Zapfen- und Zapfenschuppenformen. (**On the Formenkreis of spruce in autochthonous stands in the Bavarian Forest according to the shapes of the cones and cone scales**).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 14–22.

The morphological characteristics of spruce cones collected in the Bavarian Forest between the Arber and Falkenstein mountains were studied and the trees divided into six principal groups, designated *rotundata*, *obovata*, *ovata*, *elliptica*, *rhomboidea* and *acuminata*, respectively, on the basis of the length and breadth of their cone scales and the distance between the broadest part of the scale and its tip. The *rotundata* type corresponds to *Picea abies* vars. *arctica* and *arrotondata* and the *obovata*, *ovata*, *elliptica*, *rhomboidea* and *acuminata* types to *P. abies* var. *obovata*, *fennica*, *montana*, *europaea* and *acuminata* respectively. A large number of intermediate types, presumably the result of hybridization, were also found. It was observed that the frequency with which a race occurred in any given locality depended upon height above sea level, "altitude" races having been developed in this instance in much the same way as geographical races arise. In the valleys var. *acuminata* predominated, var. *fennica* was found in considerable numbers but var. *europaea* was infrequent; at high altitudes vars. *obovata* and *fennica* were the most frequent and vars. *acuminata* and *montana* were rare. Var. *europaea* was most frequently found at intermediate heights of between 700 and 1150 m. It is suggested on the basis of morphological and ecological evidence that vars. *acuminata* and *europaea* are the oldest basic forms and that var. *montana* developed from var. *acuminata* and vars. *fennica*, *obovata* and *rotundata* developed from var. *europaea* during the last Pleistocene glacial period.

3821 McComb, A. L.
The European larch: its races, site requirements and characteristics.
For. Sci. 1955 : **1** : 298–318.

Information on the above is reviewed with reference to the literature published recently in Europe and the USA.

3822 Nilsson, B.
Kvalitets- och produktionsförhållanden i ett klonförsök av tall. (**Conditions affecting quality and yield in a clonal trial of pine**).
Årsberätt. För. Växtf. Skogstr. 1955 : 33–46.

Mother pines from different regions and altitudes were compared in clonal trials at Brunsberg, Sweden, by means of grafted trees. Although parent trees from the higher altitudes had more obtuse branching angles and finer branches than those from low altitudes, no significant differences related to altitude were found in these characters among the clones. On the other hand, clones from high altitudes were taller and of larger volume than those from low altitudes while the parent trees did not show this difference; the parents, however, showed improved tree form with increasing altitude. Correlations between parent trees and clones with respect to branch size, branching angle and diameter of trunk were positive but generally rather low.

3823 Toda, R.
On the crown slenderness in clones and seedlings.
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 1–5.

Selection of trees with narrow crowns and an improved rate of growth at the Miyazaki Experimental Station, Japan, is reported. The character narrow crown, which is thought to be determined by a system of polygenes, is associated with thin branches and wood of good quality. An added advantage of narrow crowns is that they permit a larger number of trees to be grown per given area. A promising clone of *Larix decidua*, Tinghus, and three other clones, in addition to their progeny obtained by self pollination, were compared. In all young trees the crown projection area was greater than the occupation area; in fully-grown trees the reverse held true. Intraclonal differences in crown shape were observed, depending on the physiological age of the part of the tree from which the cutting had been taken.

3824 WRIGHT, J. W.
Cone characteristics and natural crossing in a population of F_1 pine hybrids.
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 45–48.

Crosses between *Pinus densiflora* ♀ and *P. sylvestris* ♂ and between *P. thunbergii* ♀ and *P. densiflora* ♂ were effected in 1940 at the Northeastern Forest Experiment Station of the US Department of Agriculture and the resulting hybrids planted out in Central Pennsylvania in 1945. Examination of the cone characteristics of the young trees in 1948 showed that they were morphologically intermediate between the parent species. The most useful diagnostic characteristics for distinguishing species from hybrids were cone colour, basal-scale profile and the thickness of the scale tip; a single cone evaluated for all three characteristics could be identified with certainty but a single characteristic was, by itself, insufficient. The early fruiting of *P. densiflora* proved dominant in all F_1 hybrids. Cones resulting from the open pollination of the hybrids in a mixed planting with their parent species were sown in 1948; a study of the 3-year old seedlings in 1951 led to the conclusion that over 50% of them represented back crosses to one of the two parents concerned. Both the F_1 hybrids and their backcross progenies were superior to the parent species in growth rate and vigour; this feature was particularly pronounced in *P. thunbergii* x *P. densiflora* and in the back-cross progeny of this hybrid to *P. thunbergii*.

3825 SIMAK, M.
Samengrösse und Samengewicht als Qualitätsmerkmale einer Samenprobe (*Pinus silvestris* L.). [**Seed size and seed weight as indicators of the quality of a seed sample (*P. silvestris* L.)**].
Medd. SkogsforsknInst. Stockh. 1955 : **45** : No. 9 : 1–17.

It is shown that seed size and weight are to some extent associated with embryo quality but that the relationship is less apparent in mixed seed samples than in samples from single trees. Where seeds are formed under favourable climatic conditions embryo quality is generally good and the relationship is obscured. Although selection for large size would result in improved germination, it is not recommended since the smaller and lighter seeds often produced by plus trees would be rejected, thus leading to the loss of possibly valuable breeding material.

3826 PAVARI, A.
Una nuova varietà de pino loricato. (**A new variety of loricate pine**).
Monti e Boschi 1953 : **4** : p. 130.

A variety found in Montenegro in 1950 is described. Designated *Pinus heldreichii* var. *pancici*, it may be distinguished from *P. heldreichii* by its light-green needles and small, dark-brown cones.

3827 DE WIT, H. C. D.
Nomina nuda are not illegitimate!
Taxon, Utrecht 1956 : **5** : 4–7.

It is pointed out that *nomina nuda* do not constitute valid publications; therefore they cannot be illegitimate nor lead to the rejection of a later homonym. There is some difficulty however in deciding how much diagnostic information is required to raise an epithet from the status of a *nomen nudum* to a legitimate publication. The author follows Boivin in taking *Pseudotsuga taxifolia* (Poiret) Britton as the correct designation of the Douglas fir, the earlier names being regarded as *nomina nuda*.

3828 S., F. A.
***Pseudotsuga taxifolia* (Poiret) Britton *versus P. Menziesii* (Mirbel) Franco.**
Taxon, Utrecht 1956 : **5** : p. 19.

A synopsis is given of Boivin's reasons for regarding *Abies taxifolia* Desf. (1804) as a *nomen nudum* (cf. Abst. 3827). If these reasons are accepted, *A. taxifolia* Poiret (1805) and *Ps. taxifolia* Poiret (Britton) are legitimate.

3829 S., F. A.
Pseudotsuga Menziesii versus Pseudotsuga taxifolia.
Taxon, Utrecht 1956 : **5** : 38–39.

Further to the note summarized in Abst. 3828, the author refers to a reply to Boivin by Franco in which *Abies taxifolia* Desf. (1804) is shown to be validly published since *Pinus picea* L. is quoted as a synonym. The oldest legitimate name for the Douglas fir is therefore *Abies menziesii* Mirbel (1825) [= *Ps. menziesii* (Mirbel) Franco].

3830 Ross, R.
Homonyms, nomina nuda, and the Douglas fir.
Taxon, Utrecht 1956 : **5** : 41–43.

A brief discussion on the definition of *nomina nuda* is presented (cf. Abst. 3827). *Pseudotsuga menziesii* (Mirbel) Franco is accepted as the correct name of the Douglas fir (cf. Abst. 3829).

3831 Shinners, L. H.
Pseudotsuga and pseudo-science.
Taxon, Utrecht 1956 : **5** : 43–46.

In connexion with the proposal to replace the commonly used epithet *Ps. taxifolia* (Poiret) Britton by *Ps. menziesii* (Mirbel) Franco (cf. Absts. 3829–30), the author deprecates strongly the suggestion that stabilization of nomenclature should be allowed to override the meticulous application of the International Rules of Botanical Nomenclature.

3832 Johnsson, H., Persson, A. & Eriksson, G.
Tallens rastyper i Sydsverige. (**Racial types of pine in southern Sweden**).
Årsberätt. För. Växtf. Skogstr. 1955 : 19–32.

A survey is presented of pine stands in southern Sweden. In many provinces, stands are chiefly of the minus type but in a few areas, notably Östergötland and Tiveden, stands classed as normal 1 or the slightly inferior type normal 2 are found.

3833 Rohmeder, E. & Meyer, H.
23-jährige Anbauversuche in Bayern mit *Pinus contorta* Douglas (*P. murrayana* Balfour) verschiedener Herkunft. [**23-year old cultivation trials in Bavaria of *P.contorta* Douglas (*P. murrayana* Balfour) of different provenance**].
Forstwiss. Zbl. 1952 : **71** : 257–72.

A report on 23-year old stands of *P. contorta* grown in Bavaria from seed obtained from different localities in North America is presented. Provenance types differed widely in their soil and climatic requirements. For example, ecotypes from coastal areas of Washington and Oregon did best in sheltered, low-lying districts but, for localities above 500 m. and with heavy snowfalls, only seed from British Columbia and the Oregon-California border district, both of which lie over 500 m. above sea level, was suitable. *P. contorta* is resistant to wind damage, frost and drought but does not do well on chalky, alkaline or peat soils. In general its performance in Bavaria compares favourably with that of indigenous pines but it is somewhat more susceptible to diseases and insect pests.

3834 Jentsch, J.
Pinus murrayana (Balf.) II. Teil. Ein Provenienzanbauversuch. [***P. murrayana* (Balf.). Part II. A provenance trial**].
Arch. Forstw. 1954 : **3** : 518–54.

Material collected from six localities at different altitudes in Canada and the USA was sown at Tharandt, East Germany, in 1929–32 and evaluated in 1936 and 1947 for the following and other characters: height, diameter, strength and percentage of bark, form, slenderness, and stand damage due to snow or to *Evetria buoliana* or *E. resinella.* Marked genotypic differences were found among trees from different climatic regions. Some forms showed a number of desirable characters and may prove of use for cultivation or breeding in Germany.

3835 Messer, H.
Untersuchungen über das Fruchten der Weymouthskiefer (*Pinus strobus* L.) und der grünen Douglasie (*Pseudotsuga taxifolia* var. *viridis*). [**Investigations on the fruiting of the Weymouth pine (*P. strobus* L.) and the green Douglas fir (*P. taxifolia* var. *viridis*)**].
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 33–40.

The seed production of stands of the Weymouth pine and the green Douglas fir, both of which originated from North America but have been grown in Germany for over a century, was investigated to obtain information on whether home demand for seeds could be met from indigenous élite mother trees. In the case of the former species seed production is more than sufficient to cover German requirements; the fruiting of the green Douglas fir is, however, extremely erratic in Germany and seed will probably have to be imported for some years to come.

3836 Mergen, F.
Improving the early growth of long-leaf pine.
For. Frmr. 1954 : **13** : 8–9, 16–19; also
Nav. Stores Rev. 1954 : **64** : 12–13, 21.

Pinus palustris, despite its drought resistance and other desirable characteristics, is distrusted by many foresters because of its susceptibility to brown-spot disease in the juvenile stage and its frequently slow rate of growth. A preliminary account of selection for rapid juvenile growth and disease resistance at the Lake City Research Station, Fla., is given. Hybrids between *P. palustris* and *P. taeda* and between *P. caribaea* and *P. palustris* are also being studied.

3837 Zak, B.
Inheritance of resistance to littleleaf in Shortleaf Pine.
Res. Notes SE For. Exp. Sta. 1955 : No. 88 : Pp. 2.

Resistance to *Phytophthora cinnamomi* was shown to be a genetically determined character in tests of the open-pollinated progenies of six apparently resistant trees at the Southeastern Forest Experiment Station, Asheville, North Carolina. One tree produced over 80% resistant progeny.

3838 Søegaard, B.
Leaf blight resistance in Thuja. Experiments on resistance to attack by *Didymascella thujina* (Dur.) Maire (*Keithia thujina*) on *Thuja plicata* Lamb.
Årsskr. K. Vet.- o. LandbHøjsk., Kbh. 1956 : 30–48.

In studies carried out at the Hørsholm Arboretum, Denmark, it was found that seedling resistance to *D. thujina* is determined by a single dominant gene occurring in the homozygous condition in *Th. standishii*, the recessive allele being carried by the susceptible *Th. plicata*. By bagging ♀ flowers of *Th. plicata* and pollinating them with *Th. standishii*, crosses between the two species are readily effected.

Resistance depended partly on the physiological stage of development of the tree, cuttings from 25-year-old *Th. plicata* trees being more resistant than seedlings from the same tree.

VEGETABLES

3839 Banga, O.
International conference on the improvement of vegetable varieties at Wageningen, Netherlands, on August 26 and 27, 1955.
Euphytica, Wageningen 1956 : **5** : 18–32.

A survey is given of some of the subjects dealt with in reports and discussions at the above conference, a full account of which will be published in the Proceedings of the XIV International Horticultural Congress. Among the topics discussed were adaptation to consumers' requirements in different countries, quality, climatic adaptation, disease resistance and suitability for storage, handling, transportation and processing. A list of recently developed vegetable varieties with resistance to various diseases is included.

3840 Hahn, P.
Neue Gemüsesorten und ihre Anbaueignung. (**New vegetable varieties and their agronomic characteristics**).
Dtsch. Gartenbau 1956 : **3** : 39–41.

The midearly gherkin variety Eva, from the Quedlinburg Plant Breeding Institute, is distinguished by its high yields, the uniform shape of its fruits and its resistance to gummosis. The outdoor tomato varieties Fanal [Beacon] and Harzer Kind [Child of the Harz] also originate from the Quedlinburg Plant Breeding Institute. Fanal matures early, is resistant to cracking and transports well. Some 50% of the total crop is ready for the market within 95 days of sowing. Harzer Kind is a late-maturing, high-yielding variety with good resistance to diseases and inclement weather conditions. It is resistant to cracking and possesses an excellent flavour. The stringless dwarf French beans Glückauf and Massliebchen both give high yields of good-quality beans but are susceptible to anthracnose. Glückauf is resistant to halo blight. Frühgold [Early Gold] and Goldregen [Golden Rain] are productive, early-maturing French beans that give reliable yields. The new pea varieties Bördewunder [Wonder of the Plain], Echo, Fabula, Kobold [Goblin], Rapid and van Waverens Titan II are all distinguished by their high yields.

3841 Philipp, F.
Ergebnisse der Frühgemüsesortenversuche 1955, I. (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of trials of early vegetable varieties in 1955, I. (In connexion with the commission for the Austrian book of cultivated varieties)**].
Mitt. Klosterneuburg : Ser. B. : 1956 : **6** : 123–40.

Tabulated data are presented on new and established varieties of radish, lettuce and peas tested at the Federal Agricultural Station, Schönbrunn, and at other centres in Austria in 1955 (cf. Abst. 2870).

3842 Morettini, A.
Il miglioramento della produzione delle sementi orticole in Italia. (**The improvement of vegetable seed production in Italy**).
Orticoltura italiana. Riv. Ortofloro-fruttic. ital. 1956 : **40** : Num. Spec. 35–46.

The importance of improving the varieties by breeding as well as production and maintenance of pure seed is emphasized and a number of centres in Italy where breeding of vegetables and potatoes is in progress are referred to, the facilities in Italy being compared somewhat unfavourably with those in the Netherlands.

3843 Drozd, A. M.
(Experimenting on breeding and seed growing of horticultural plants).
Agrobiologija (Agrobiology) 1956 : No. 2 : 11–16. [Russian].

Cucumber. Among the achievements of breeding work at Krymskaja, Krasnodar territory, mention is made of the new cucumber variety Posrednik 97 Ž [Bridging 97 Ž], obtained by hybridization between Russian and Japanese varieties and characterized by predominantly ♀ flowers. It is grown with another variety supplying pollen for the production of heterotic seed. The yield of the F_1 exceeds that of other varieties by 50–60%. Especially high yields of first fruits are obtained when variety 96 is used as the ♂ parent.

Tomatoes. Varieties notable for productiveness and high quality have also been bred. Most are hybrids involving Break o' Day as the ♀ parent. Pervenec 190 [First-born 190] (Break o' Day x Ljubimec Kolhoza [Kolhoz Favourite]) shows resistance to drought.

Peas. Rannii Konserveyi 20/21 [Early Canning 20/21] (Peter Pan x Rannii Zelenyi 033 [Early Green 033]) is distinguished by great earliness and high yield. Hybrid 370 (Laxton x F_6 of hybrid 36/46), hybrid 320 (Skorospelyi Mozgovoi [Early Marrow-fat] x VIR 2442 [Plant Industry 2442]) and hybrids 324 and 325, both from Prevoshodnyi [Excellent] x VIR 2442, are new hardy marrow-fats outyielding other varieties by 20–30%.

3844 Fontell, I.
Sorter och stammar av köksväxter. **(Varieties and strains of vegetables).**
Tidskr. Lantm., Helsinki 1956 : **38** : 44–46.

It is urged that Finnish variety trials should include testing for quality, trueness-to-type and adaptation to different parts of the country, as do the trials conducted by the Swedish State Horticultural Station and the Danish Cooperative Committee for testing vegetables.

3845 Lamm, R., Hintze, S. & Åvall, H.
Klassificerande sort- och stamförsök med köksväxter 1952–1955. **(Classificatory trials of varieties and strains of vegetables, 1952-1955).**
Medd. Trädgårdsförs. No. 98 : Pp. 26.
Nya sorter och stammar av köksväxter. **(New varieties and strains of vegetables).**
Försök o. Forskn. 1956 : **13** : 21–22.

In the first paper, details are given of the results of trials held at the State Horticultural Station, Alnarp, Sweden. A list of all the strains awarded first class rank is provided and short descriptions are given of new strains. The latter include new forms of winter dill, cucumber, cauliflower, cabbage, musk melon, parsnip and radish. The second article gives abbreviated descriptions of the new material dealt with in the first.

3846 Nilca, V. *et al.*
Cercetări cu privire la posibilităţile de extindere a culturii legumelor şi pomilor în regiunea munţilor Apuseni. **(Experiments on the possibilities of extending the cultivation of vegetables and fruit trees in the region of the Apuseni mountains).**
Bul. Şti. Secţ. Şti. Biol. Agron. Geol. Geogr. 1955 : **7** : 29–46.

Variety trials of tomatoes, cabbages and carrots in the above region are reported. The authors are of the opinion that vegetable and fruit-tree growing could be greatly improved in the area by the application of Mičurinist agrotechnical principles.

3847 **Nine A-AS awards.**
Sth. Seedsman 1956 : **19** : No. 3 : 19, 22–23.

The following six new vegetable varieties have received All-America Selection awards for 1957:—
The radish Champion, with large, bright red, spherical roots of high quality, is suitable for home or market use. It may be planted early and has a long season.

Ruby Queen is a fairly early, globe-shaped selection from the beetroot Special Crosby and has dark red skin and deep crimson flesh with indistinct growth rings. It is particularly suitable for garden use.

The dwarf snapbean, Greencrop, has been described in Abst. 237. The wax snapbean, Choctaw, is productive, stringless, resistant to mosaic and able to set pods under conditions of drought and high temperatures.

Smoothie is a smooth, cylindrical cucumber about eight inches long, with dark green skin and a few white spines. It is good in quality and equals standard varieties in yield.

Black Beauty, a summer bush squash, is 3–10 days earlier than Fordhook Zucchini and remains highly productive over a long bearing season.

3848 **One hundred years of seeds.**
Sth. Seedsman 1956 : **19** : No. 4 : 14–16, 63, 65.

As part of its centenary celebrations, the Ferry-Morse Seed Company is releasing the following varieties: the very early red pepper Early Bell; the dark green sweet pepper Liberty Bell, which is resistant to tobacco mosaic and tolerant of cucumber mosaic; the yellows-resistant cabbage Greenback; the cucumbers Palomar DMR and Long Marketer, the former resistant to downy mildew; Tall Utah 52–70 H, a tall new celery; the carrot Gold Pak (cf. *PBA*, XXV, Abst. 3459); Silver Bell, a squash with short bell-shaped fruits silvery-grey in colour and resembling the sweet potato in flavour; and Homestead F-M, a productive selection from the standard variety Homestead (cf. *PBA*, XXIII, Abst. 1554).

3849 SCHMIDT, E. (JUN.).
La culture des porte-grains de légumes "Hybrides F_1" aux Etats-Unis. **(The cultivation of seed parents of F_1 hybrid vegetables in the United States).**
Rev. hort. suisse 1956 : **29** : 142–46.

This brief popular account of the commercial production of F_1 hybrid seed of tomatoes, melons and cucumbers in the USA includes descriptions of the techniques employed in the artificial pollination of the seed parents.

3850 ROUX, A.
Vergleichende Untersuchungen an den Blüten von Tomaten, Puffbohnen und Gemüseerbsen (Pal- und Mark-) zum Zwecke der Verwendbarkeit als Unterscheidungsmerkmal. [**Comparative investigations on the flowers of tomatoes, broad beans and garden (shelling and marrowfat) peas for the purpose of application as a distinguishing characteristic**].
Saatgutwirtschaft 1956 : **8** : 134–37.

In the tomato the length and degree of hairiness of the style, petal number and sepal number are recommended as useful criteria in varietal identification. In broad beans the intensity of colour of the black spot on the flower and of the small spot of the bract proved useful; these two characters were shown to be linked. The shape of the standard and upper sepals in peas was a useful aid in distinguishing between varieties.

3851 DREWES, H.
Breeding vegetable varieties for prepackage.
Market Gr. J. 1955 : **84** : p. 23.

Recommendations are made as to American varieties of radish, tomato, carrot, celery, spinach and sweet corn suitable for prepacking.

3852 KRICKL, M.
Karotten und Petersilie: Samenerntejahr 1955. Ist die züchterische Verbesserung der Keimfähigkeit möglich? **(Carrots and parsley: seed harvest year 1955. Is it possible to breed for improved germinability?)**
Saatgutwirtschaft 1956 : **8** : 102–04.

It was shown at the Schönbrunn Horticultural Research Station, Vienna, that some carrot and parsley plants produced a higher proportion of seeds capable of germinating under unfavourable environmental conditions than others. The selection of lines with improved seed germinability should therefore prove feasible.

3853 AXELSSON, F.
Das Auftreten eines Slender-Typs bei *Raphanus sativus* L. und seine Vererbung. **(The occurrence of a slender-type in *R. sativus* L. and its inheritance).**
Agri hort. genet., Landskrona 1956 : **14** : 54–59.

Yellowish-green individuals of the slender or *gracilis* type with long hypocotyls and small primary leaves were found in the Swedish variety Brilliant. They differed from normal plants in the possession of a single recessive gene, *gr*.

3854 NISHIYAMA, I.
(Studies on artificial polyploid plants. XIV. Difference in seed development between direct and reciprocal crosses between diploid and tetraploid radishes).
Shokuryo Kagaku Kenkyu/Res. Fd. Sci. 1949 : No. 2 : 49–54. [Japanese].

NISHIYAMA, I.
Polyploid-studies in the Brassiceae, I. The seed development in reciprocal crosses between diploid and tetraploid *Raphanus*.
Mem. Res. Inst. Fd. Sci. Kyoto Univ. 1952 : No. 3 : 1–7.

Direct and reciprocal crosses were made between $2n$ and colchicine-induced $4n$ strains of Japanese radish varieties. Viable triploids were obtained from the $4n$ ♀ x $2n$ ♂ cross but not from the reciprocal.

3855 NISHIYAMA, I.
(Studies on artificial polyploid plants. XV. Spontaneous crossing between diploid and tetraploid radishes).
Shokuryo Kagaku Kenkyu/Res. Fd. Sci. 1949 : No. 2 : 55–61. [Japanese].

Nishiyama, I.
Polyploid-studies in the Brassiceae, II. Free crossing between $2x$- and $4x$- varieties in *Raphanus sativus*.
Mem. Res. Inst. Fd. Sci. Kyoto Univ. 1952 : No. 3 : 8–14.

The degree of crossing between $2n$ and $4n$ strains of Japanese radishes under natural conditions and at various distances apart was investigated. The $3n$ seeds were detected by selective sieving. The percentage of $4n$ ♀ x $2n$ ♂ crossing ranged from 22 to 76%, varying with the two parental varieties concerned. Little seed was set in the reciprocal cross.

3856 Nishiyama, I. & Inamori, Y.
(**Studies on artificial polyploid plants. XVII. On $2x$ x $4x$ crosses in *Brassica*, and in particular on the occurrence of $4x$ hybrids**).
Kyoto Dagaku Shokuryo Kagaku Kenkyusho Hokoku/Bull. Res. Inst. Fd. Sci. Kyoto Univ. 1952 : No. 10 : 99–106. [Japanese].

In continuation of the work reported in Abst. 3855, the authors made a number of intraspecific and interspecific crosses between $2n$ and $4n$ strains of *B. chinensis*, *B. pekinensis* and *B. rapa*. In addition to the expected $3n$ F_1 hybrids, $2n$ and $4n$ hybrids were also produced. The pollen fertility of the $3n$ F_1 hybrids was unexpectedly high, in some cases exceeding 90%. (Cf. Abst, 3873).

3857 Kroh, M.
Genetische und entwicklungsphysiologische Untersuchungen über die Selbststerilität von *Raphanus raphanistrum*. (**Investigations on the genetics and developmental physiology of self sterility in *R. raphanistrum***).
Z. indukt. Abstamm.- u. VererbLehre 1956 : **87** : 365–84.

The results of studies on the genetical basis of self sterility in *R. raphanistrum* are discussed with reference to findings by other authors on self sterility in *Antirrhinum* sp., *Nicotiana* spp., *Oenothera* spp., *Petunia violacea*, *Brassica oleracea* and several other crucifers. Self and cross sterility in *R. raphanistrum* is attributed to the action of two series of alleles, *S* and *Z*, each of which comprises four alleles. Inhibition of pollen-tube germination was shown to be due to a chemical substance present on the surface of the stigma; when the surface of the stigma was removed or when pollen grains were inserted in an incision made in the stigma, the sterility mechanism was circumvented and fertilization, which resulted in the production of viable seeds, took place. It is therefore concluded that, in *R. raphanistrum*, the incompatibility reaction is confined to the surface of the stigma. These findings do not, however, apply to all crucifers (cf. *PBA*, XXV, Abst. 1592).

3858 Praktijkproeven met Ronde Witpunt radijs 1953–1954. (**Field trials of round, white-tipped radishes, 1953-54**).
Meded. Dir. Tuinb. 1956 : **19** : 301–14.

Some 50 selections of round, white-tipped, red radishes were classified into 6 groups according to the size of the top and the colour pattern of the roots. Data on yield, period to maturity, uniformity, flavour and resistance to sponginess and cracking are provided.

3859 Löhrke, L.
Beiträge zur Züchtung und zum Anbau der Topinambur (*Helianthus tuberosus* L.). I. Vorvedegung des Blühtermins, Kreuzungen mit Sonnenblume (*Helianthus annuus*) und Selektion. [**Contributions to the breeding and the cultivation of the Jerusalem artichoke (*H. tuberosus* L.). I. Advancing the flowering time, crosses with sunflower (*H. annuus*) and selection**].
Z. Pflanzenz. 1956 : **35** : 321–44.

At the Marquardt Institute for Fruit Cultivation and Breeding, Eastern Germany, exposure to 8, 10 or 12 hr. photoperiods for 4, 8 or 12 weeks, forcing in a greenhouse and grafting on to sunflower were all ineffective as methods of advancing the flowering time of the Jerusalem artichoke, essential if rapid breeding work is to be carried out with this crop under German conditions. Some of the results of exposure to short-day conditions indicated, however, that changes in photoperiod combined with alternating temperatures might possibly result in earlier flowering in some varieties. A few viable seeds were obtained from a cross between the sunflower and the Jerusalem artichoke, using the sunflower as the ♀ parent; the reciprocal cross failed. The F_1 had a stunted growth habit and produced few flowers and no tubers; morphologically the plants were similar to the sunflower and may, in fact, have resulted from selfing.

Selection for increased yields of tubers and foliage, improved tuber shape and higher sugar, protein, dry matter and inulin contents was carried out on a number of unspecified varieties from the USA; three clones, designated Stamm P204 [Strain P204], Stamm P336 and Stamm

P203, gave better results than the East German variety Dornburger and it is hoped to obtain new high-yielding varieties with improved nutritive qualities by intercrossing these and other clones of North American provenance.

3860 LAVEZZINI, A.
La coltura ed il miglioramento della cipolla e dell'aglio. (**The cultivation and improvement of onions and garlic**).
Orticoltura italiana. Riv. Ortoflorofruttic. ital. 1956 : **40** : Num. Spec. 248–63.

In a general account of onion and garlic growing in Italy indications are given of the methods of pure seed production, the possibility of producing hybrid seed by using male-sterile lines is mentioned and the varieties cultivated are described briefly.

3861 GENEVÉS, L.
Recherches sur les effets cytologiques du froid. (**Researches on the cytological effects of cold**).
Rev. Cytol., Paris 1955 : **16** : 1–178.

A section of this work, which is devoted chiefly to the effects upon nondividing cells of exposing roots of endive and onion to temperatures of 0° to −180° C., is concerned with mitotic disturbances caused by cold treatment in onions. When cooled to 0° C. in water, nuclei in onion root tips became irregular in shape, the chromosomes became shorter and more spiny than usual in late prophase and metaphase cells, some other slight abnormalities of mitosis were observed and interphase lasted longer than in untreated material; the irregularities disappeared on rewarming. The mitotic rate was about halved in roots grown at 0° C. but on warming attained the normal rate. Similar but more marked effects were observed in material frozen at −5 to −6° C. When treated with liquid air at −180° C., resting cells deviated strongly from their normal appearance but dividing cells appeared to be little affected.

3862 PERRY, B. A. & JONES, H. A.
Performance of short-day pink-root-resistant varieties of onions in southern Texas.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 350–53.

In tests in two localities in southern Texas, the varieties Excel, L36, Eclipse and L365 and F_1 hybrids Excel (986) x L 281W, Excel (986) x L303 and Excel (986) x L365 proved to be highly resistant to pink root (*Pyrenochaeta terrestris*), as shown by their good yields on infested soil. Although somewhat less resistant, L281W produced satisfactory yields.

3863 JONES, H. A. & PERRY, B. A.
Inheritance of resistance to pink root in the onion.
J. Hered. 1956 : **47** : 33–34.

Data from F_2 and back-cross progenies of crosses between susceptible and resistant lines indicate that resistance to *Pyrenochaeta terrestris* is determined by a single recessive factor.

3864 YAMAURA, A.
(**Chromosome numbers of plants obtained by interspecific crossing and of their offspring**).
Senshokutai (Chromosome)/Kromosomo 1955 : No. 25–26 : 894–98. [Japanese].

The chromosome complements of the F_1 and F_2 of *Allium cepa* x *A. fistulosum*, F_1 and F_2 of *A. odorum* x *A. fistulosum* and F_1 of *A. fistulosum* x *A. ledebourianum* are described and illustrated. The respective chromosome numbers are 16, 24–25, 31, 31 and 16.

3865 CICINA, S. I.
(**Onion species from Kazahstan and the prospects of their introduction**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 21 : 30–35. [Russian].

Among the indigenous species and forms studied at Alma-Ata, *Allium multitabulatum* and two varieties of *A. longicuspis*, namely Česnok Čimkentskiĭ [Čimkent Garlic] and Česnok Čokparskiĭ [Čokpar Garlic], were of economic value. The former outyielded cultivated varieties of onion and was distinguished by greater earliness and hardiness and superior flavour. Both forms of *A. longicuspis* were more productive than the standard Dunganskiĭ and produced seed out of doors.

3866 SEMENOVA, M.
(**The wild Siberian chive**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 5 : 32–33. [Russian].

A description is given of a wild form from Jakutia, distinguished by productiveness and high carotene and ascorbic acid contents.

3867 SCARAMUZZI, F.
La coltura ed il miglioramento del finocchio dolce. (**The cultivation and improvement of sweet fennel**).
Orticoltura italiana. Riv. Ortoflorofruttic. ital. 1956 : **40** : Num. Spec. 214–24.

A study of the floral biology of *Foeniculum vulgare* var. *dulce* has shown that a considerable amount of cross pollination occurs and the varieties grown in Italy are genetically heterogeneous. By selection it has been possible to reduce the proportion of plants that fail to produce swollen leaf bases and to improve their size (cf. *PBA*, XXIII, Abst. 725).

3868 NATTI, J. J.
Downy mildew on broccoli and other crucifers.
Fm. Res. 1956 : **22** : No. 2 : p. 10.

Information is given on the reaction of varieties of broccoli, cabbage, cauliflower and several other cruciferous crops to downy mildew (*Peronospora parasitica*) when artificially inoculated in the greenhouse with collections from various parts of New York State. Chinese cabbage, kale, mustard, rape and turnip varieties were resistant; all of the seven varieties of radish tested were immune. Varieties of broccoli, Brussels sprouts, cabbage, cauliflower, collard, kohl rabi and swede were susceptible. In a search for sources of resistance, resistant plants were found among foreign introductions of cauliflower.

3869 THOMPSON, A. E. & HEPLER, P. R.
A summary of resistance and susceptibility to *Puccinia asparagi* DC. within the genus *Asparagus*.
Plant Dis. Reptr. 1956 : **40** : 133–37.

With the improved inoculation techniques used in investigations at the Department of Horticulture, University of Illinois, it was possible to demonstrate a degree of susceptibility to *P. asparagi* in some of the perfect-flowered species previously reported as resistant or immune. None of the diecious species tested were more resistant than *A. officinalis*. So far hybridization between *A. officinalis* and perfect-flowered varieties has failed.

3870 FRANCHI, P.
La coltura ed il miglioramento del cavolo verzotto e cappuccio. (**The cultivation and improvement of Savoy cabbage and cabbage**).
Orticoltura italiana. Riv. Ortofloro-fruttic. ital. 1956 : **40** : Num. Spec. 267–79.

An account of the cultivation of cabbages and Savoys in Italy contains brief descriptions of the varieties grown. It is thought that they could with advantage be reduced in number and indications are given of the main characteristics desired in a variety, with an outline of the way in which improvement can be effected by selection.

3871 IIZUKA, M.
(**Studies on the fertility of artificial polyploid plants. I. The correlation between age of flower and fertility in *Brassica* and *Raphanus***).
Kyoto Dagaku Shokuryo Kagaku Kenkyusho Hokoku/Bull. Res. Inst. Fd. Sci. Kyoto Univ. 1951 : No. 7 : 19–25. [Japanese].

The plants investigated were $2n$ and $4n$ strains of *Brassica pekinensis*, *B. rapa* and radish. In all cases the percentage set hardly declined till after 2 days after flowering. The rate of decline thereafter was greater in $4n$ than in $2n$ *Brassica* and conversely for radish.

3872 IIZUKA, M.
(**Studies on the fertility of artificial polyploid plants. III. Bud pollination and fertility in *Brassica* and *Raphanus***).
Kyoto Dagaku Shokuryo Kagaku Kenkyusho Hokoku/Bull. Res. Inst. Fd. Sci. Kyoto Univ. 1955 : No. 17 : 52–60. [Japanese].

In continuation of the work summarized in Abst. 3871, the author examined seed set in $2n$ and $4n$ strains of *B. pekinensis*, *B. rapa* and radish, 1–9 days before blooming. The seed set in both $2n$ and $4n$ *Brassica* strains declined when pollination preceded anthesis by more than 4 days; in the radish strains, the decline was evident if the corresponding interval exceeded 2 days.

3873 NISHIYAMA, I. & INAMORI, Y.
Polyploidy studies in the Brassiceae, III. Hybridization between diploid *Brassica* species ($2n = 20$) and their autotetraploids.
Mem. Res. Inst. Fd. Sci. Kyoto Univ. 1953 : No. 5 : 1–13.

Direct and reciprocal $4n$ x $2n$ crosses within and between Japanese strains of *B. pekinensis*, *B. chinensis* and *B. rapa* are reported. All combinations proved highly infertile but occasional $2n$, $3n$ and $4n$ offspring were secured. Data are provided on the pollen fertility and seed setting of the offspring after open pollination. The $3n$ plants showed unexpectedly high percentages of good pollen. (Cf. Abst. 3856).

3874 TATEBE, T.
(**Studies on self incompatibility in cabbage. II. On the inhibiting substance**).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1955 : **24** : 168–74. [Japanese].

Excision of the stigmas at the bud stage or at anthesis increased the receptivity of cabbage styles to incompatible pollen at flowering time. Pollination experiments in which the stigmas of one strain were grafted on to the ovaries of another showed that compatibility depended on the stigma alone and not on the underlying ovarian tissue. It is therefore concluded that the incompatibility reaction in cabbages results from the secretion of a pollen-grain inhibitor by the stigma.

3875 BONTEA, V.
Putregaiul negru sau putregaiul uscat al verzei. (***Phoma lingam***).
Anal. Inst. Cere. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 379–427.

This general phytopathological study of the above fungus includes data on relative susceptibility of varieties of cabbage, kohl rabi and cauliflower grown in Rumania. Early cabbages such as Minunea timpuriilor [Miracle of the Earlies], Prima recoltă [First Pick] and Ditmark Treib [Ditmark Forcing] were least damaged by infection.

3876 **New cabbage from U. of Wisconsin, USDA.**
Sth. Seedsman 1956 : **19** : No. 3 : p. 43.

Badger Ballhead, developed at the University of Wisconsin from a cross between Wis. Ballhead and Wis. Hollander, combines good market quality with high resistance to yellows and moderate resistance to mosaic.

3877 ZOSCHKE, U.
Untersuchungen über die Bestimmung des Geschlechts beim Spinat (*Spinacia oleracea* L.) unter besonderer Berücksichtigung der Züchtung eines monözischen oder gleichzeitig schossenden Spinates. [**Investigations on the determination of sex in spinach (*S. oleracea* L.) with special reference to the breeding of a monecious or simultaneously shooting spinach**].
Z. Pflanzenz. 1956 : **35** : 257–96.

The percentage of naturally occurring monecious plants in different varieties was studied and found to vary from 0·7% in Matador to 11·1% in Universal. The monecious plants were divided into five categories according to the number of ♀ flowers they bore; the majority had more ♀ flowers than ♂. The monecious character proved an inherited character and, by crossing monecious plants, it was found possible to increase their percentage in each generation, mainly at the expense of the ♂ plants; after 4–5 generations the percentage of ♂ plants was reduced to less than 1% and of ♀ to approximately 20%. The sex ratio in both diecious and monecious plants was influenced to some extent by time of sowing, early sowing resulting in a higher proportion of ♀ plants. Unfavourable climatic or growing conditions increased the percentage of ♂ plants at the expense of ♀ plants in diecious spinach. A new variety, Gleichzeitig schossend [Simultaneous Shooting], was selected from Gaudy by the method described. It contains approximately 80% monecious plants, the remaining plants being mostly ♀, gives higher yields than its diecious parent and has a longer cutting period owing to the almost complete absence of ♂ plants.

It is postulated that monecious plants arise as the result of a disturbance or lack of balance in the sex chromosomes. All the monecious plants examined proved heterogametic for the XY chromosomes but feminized types contained both heterogametic and homogametic plants. Masculinized forms were predominately homogametic. Sex determination in spinach would appear to be polygenically determined, the genes influencing sex being present in both the heterosomes and the autosomes.

3878 JANISK, J.
Inheritance of sex in tetraploid spinach.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 361–63.

The F_1 of a cross between colchicine-induced pistillate (*XXXX*) and staminate (*XXYY*) tetraploids segregated in a ratio of 5 : 1 for staminate : pistillate plants (cf. *PBA*, XXV, 2458). With further breeding it was evident that the staminate plants consisted of the genotypes *XXYY* and *XXXY* in a ratio of 1 : 4. Since the sex ratios of 5 : 1 and 1 : 1 (from *XX* or *XXXX* x *XXXY* crosses) are typical of chromosome segregation in contrast to chromatid segregation, the genes for sex are either close to the centromere or bivalent pairing occurs in spinach autotetraploids.

3879 CARLSSON, G.
Förädlingsarbetet med vår-, sommar och höstspenat i Hammenhög. (**Breeding work on spring, summer and winter spinach at Hammenhög**).
Medd. Gullåkers VäxtförädlAnst., Hammenhög 1954 : Nos. 10–11 : 259–67.

The main objectives in breeding are earliness, late bolting, a low proportion of male plants, this character being related to yield, resistance to *Peronospora*, quality and growth habit. Several improved strains and one new variety, Verina OJO/53, have been produced. The last mentioned, developed from a cross between Kongen af Danmark [King of Denmark] and Juliana x Suprą, is productive, bolts late but is earlier than other late-bolting varieties, is resistant to *Peronospora*, contains a low proportion of male plants and is good in quality.

3880 Wolf, E. A. & Ruprecht, R. W.
Progress and problems in the development of an early-blight resistant celery for Florida.
Proc. Fla. hort. Soc. 1955 : **68** : 178–81.

Cooperative breeding carried out at the Everglades and Central Experiment Stations in Florida and New York State Agricultural Experiment Station at Ithaca is discussed, mainly with reference to attempts by cold treatment and other means to advance the breeding material one generation each year. Turkish introductions with dark-green hollow petioles and strong flavour have been used as sources of resistance to early blight (*Cercospora apii*). In crosses with Cornell 19 at Ithaca, one of the early-blight resistant and solid-petioled selections obtained has been advanced to the ninth generation. Other selections have been further crossed with Danish self-blanching hybrids, Utah and Pascal. An inedible Danish variety with finely cut foliage has also been used as a source of resistance. Emerald Pascal, resulting from this cooperative project, was released in 1951 (cf. *PBA*, XXII, Abst. 2297).

3881 Moja, A. & Benzoni, F.
Identificazione precoce dei caratteri genofenotipici in *Cichorium intybus* L. (**Early identification of genophenotypic characters in *C. intybus* L.**).
Ann. Sper. agr. 1956 : **10** : 455–69.

Experiments are reported which show that it is possible to remove a portion of the root sufficient to determine the relative thickness of the cortex and central cylinder without undue prejudice to the yield of seed in breeding work. Less damage was caused by removing the lower half of the root, or half of it, than by a longitudinal cut removing half the root along its whole length.

3882 Merkis, A. I.
(**Changes in the activity of some oxidizing enzymes and in chlorophyll content through vegetative hybridization in the family Cucurbitaceae**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 20 : 17–23. [Russian].

At the Principal Botanical Garden, heritable changes with regard to morphological and physiological properties were obtained in the water melon Stokes and the melon Kolhoznica [Collective Farmer] by grafting on the gourd Belaja Medovaja [White Honey]. The changes were associated with modified catalase, peroxidase and polyphenol-oxidase activity and altered chlorophyll content of the leaves.

3883 Ivanoff, S. S.
Homegarden cantaloupe.
Sth. Seedsman 1956 : **19** : No. **4** : 18–19.

Homegarden, developed at the Mississippi Agricultural Experiment Station from a cross between Calif. 5 and an inbred selection from the West Indian variety Smith's Perfect, is vigorous, productive, moderately resistant to *Pseudoperonospora cubensis* and *Erysiphe cichoracearum* and highly resistant to aphids; it also shows some resistance to leaf worms (*Diaphania* spp.). The fruits are of medium size and of excellent flavour. The variety is recommended for home growing.

3884 Hohlačeva, N. A.
(**Hybrid gourd seed**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. **4** : p. 72. [Russian].

Hybrid 45 (Karotinnaja 102 [Carotene-rich 102] x Vitaminnaja [Vitaminiferous] from Krasnodar showed heterosis for yield, resistance to disease and produced large fruits rich in carotene and other vitamins. Its yield in 1952 was 675 c. per ha. as against 468 c. and 361 c. per ha. of Karotinnaja 102 and Vitaminnaja respectively. Mention is made of the following heterotic combinations from Birjučiĭ Kut: Volžskaja Seraja [Grey Volga] x Birjučiĭ Kut 630 and Belaja Medovaja 611 [White Honey 611] x Birjučiĭ Kut 630.

3885 (**A forage gourd, Mičurinec 136**).
Nauk. pered. Opyt. seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 3 : p. 32. [Russian].

Mičurinec 136 [Mičurinist 136] was obtained by distant hybridization involving three different species at Birjuciĭ Kut. It is a productive large-fruited variety, with sugar and vitamin C contents appreciably higher than those of the variety Mamont [Mammoth].

3886 Vigh, L.
Fajtaösszehasonlító kísérletek takarmánytökkel 1954-ben. (**Comparative trials of varieties of squash for fodder in 1954**).
Növénytermelés 1955 : **4** : 169–82.

In trials conducted at Budapest, varieties of

Cucurbita pepo gave larger fruits than those of *C. maxima* but had a lower dry matter percentage and carotene content. Differences in fruit size were also observed both between and within varieties in each species. It is thought that single plant selection will be of use in breeding.

3887 ERWIN, A. T. & LANA, E. P.
The seminole pumpkin.
Econ. Bot. 1956 : **10** : 33–37.

Referring to archeological, botanical and anthropological evidence, the authors express the view that *Cucurbita moschata* is a species indigenous to Florida. The primitive Seminole pumpkin still cultivated by the Miccosukees in the remote interior of the Big Cypress Swamp is regarded as the prototype of the species.

3888 CARLSSON, G.
Avkastningskorrelation mellan grönskörd och mogna frögurkor i växthusgurkor. (**Yield correlation in greenhouse cucumbers between fruits harvested when green and ripe seed cucumbers**).
Medd. Gullåkers VäxtförädlAnst., Hammenhög 1954 : Nos. 10–11 : 290–92.

In each of a number of progenies of Rochdale and Butchers, the yield, by weight, of green cucumbers was correlated with the yield of ripe fruits. The common practice of making selections on the basis of yield of seed cucumbers rather than yield of green fruits is therefore regarded as justifiable.

3889 NAUGOLJNYH, V. N.
(**Changing sexual characteristics in cucumber plants to improve their productivity**).
Bot. Ž. (Bot. J.), Moskva 1955 : **40** : 715–19. [Russian].

At Molotov, the proportion of pistillate flowers in the variety Murom was increased when the plants were raised from seed soaked in a Methylene Blue solution. The treatment also improved earliness, hardiness and yield. The effects were apparently not heritable.

3890 LEBEDEVA, V.
(**A new high-yielding cucumber variety**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 4 : p. 21. [Russian].

Don 175 (Pobeditelj [Victor] x De-Massi) from Birjučiĭ Kut is a drought-resistant midseason variety, with fruits weighing 100–170 g. The flavour and salting properties are good. It outyields Rjabčik 357/4 [Partridge 357/4], a standard in the Rostov province, and also the standards in the Stavropolj territory and the Dagestan ASSR.

3891 GERCEN, I. A.
(**For wider introduction of a hardy cucumber**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 4 : 71–72. [Russian].

The variety referred to in *PBA*, XXIV, Abst. **3437** proved hardy under the conditions of Sverdlovsk, where the frost of −3·3° C. to −7·5° C. killed Murom, Vjaznikovskiĭ and other varieties. The first fruits were gathered on 15 June and the last on 20 September. Their flavour was good when eaten fresh or salted.

3892 WINSTEAD, N. N. & SASSER, J. N.
Reaction of cucumber varieties to five root-knot nematodes (*Meloidogyne* spp.).
Plant Dis. Reptr. 1956 : **40** : 272–75.

Fifty varieties, breeding lines and introductions of cucumber and *Cucumis anguria* 'Small Gherkin' and 'West India Gherkin' were tested for resistance to *M. incognita*, *M. incognita* var. *acrita*, *M. javanica*, *M. arenaria* and *M. hapla* at the North Carolina State College. All the cucumbers were resistant to *M. hapla* but susceptible to the other nematodes. Small Gherkin was susceptible to *M. incognita* and *M. arenaria* whereas West Indian Gherkin was susceptible only to *M. incognita* var. *acrita*.

3893 Cultiver des tomates? Évidemment, mais alors les bonnes variétés! (**Grow tomatoes? Of course, but in that case good varieties!**)
Courr. hort. 1956 : **18** : p. 88.

Tabulated data are provided on the yields, growth vigour, disease resistance, earliness and characteristics of the fruit of varieties recommended for cultivation in Belgium by the Belgian Ministry of Agriculture.

3894 DARBY, L. A.
Tomato breeding.
NAAS quart. Rev. 1956 : No. 31 : 1–9.

An account of current objectives in tomato breeding in England is presented. The topics discussed include adaptation to different growing conditions, marketing requirements, winter fruit production, fruit shape and flavour, disease resistance, plant types making for ease of cultivation or picking, heterosis and male sterility, polyploidy and the production of parthenocarpic fruit by hormone sprays, mention being made of the type of inheritance of the different characters described.

3895 Rassenproef 1954 op tomaten in openlucht. (**1954 variety trial of tomatoes in the open air**).
Tuinbouwber. 1955 : **19** : 52–53.

Information on yield, earliness, vigour, shape and quality of the fruit and disease resistance is presented for seven varieties tested in the provinces of Antwerp, East Flanders and West Flanders in 1954. Moneymaker and Rijnlands Roem [Rhineland Fame], a selection from the German variety Rheinlands Ruhm [Rhineland Fame], gave the best results; Sutton's Open-air and Rheinlands Ruhm proved unsatisfactory.

3896 Ogle, W. L.
Developing better vegetables. A progress report.
RI Agric. 1956 : **2** : No. 3 : 5–6.

In tomato breeding for high early yield at the Rhode Island Agricultural Experiment Station, line RI54–305 [(Earliana x Victor) x Danmark] has shown most promise. Strains of Butternut squash with short thick necks are being developed.

3897 Verkerk, K.
Methode van herhaalde terugkruisingen bij tomaat. (**Method of repeated back crossing in tomato**).
StudKring. PlantVeredel. Wageningen. Versl. 1955 : **48** : 659–63.

The technique of recurrent back crossing to transfer a character from one variety to another is described. The author points out that, in the USA, recurrent back crossing has proved of considerable value in transferring genes for disease resistance from wild species to cultivated tomatoes.

3898 Darby, L. A.
Crop report on eight John Innes hybrids.
Grower 1955 : **43** : 563–65.

Darby, L. A.
Tomatoes: we breed a 'new look' parent for the hybrid.
Ibid. 1955 : **43** : 629, 631.

Darby, L. A.
Tomatoes. 3. Technique of hybrid seed production.
Ibid. 1955 : **43** : 697, 699.

A popular account of the principles involved in breeding heterotic tomato hybrids is presented, with special reference to experiments in progress at the John Innes Horticultural Institution, Bayfordbury, England.

3899 Åkesson, H.
Tomatförsök 1955. (**Tomato trials, 1955**).
Weibulls Allehanda 1956 : 1–6.

Details are given of the results of Swedish trials of native and introduced varieties and F_1 hybrids. Immuna has consistently surpassed the standard, Potentate AH 8, and most of the other tomatoes in earliness and total yield and has produced a high proportion of high-grade fruits. Of the nine new lines of Immuna, seven proved to be completely free from necrosis. Immuna was similarly superior to Potentate AH 8 in Norwegian trials.

3900 Andronicescu, D., Georgescu, M., Bunescu, D. & Voinea, M.
Contribuţiuni la stabilirea combinaţiilor hibride la tomate, în vederea producerii seminţei heterozis. (**Contributions towards the establishment of hybrid combinations in the tomato with a view to producing heterotic seed**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 553–56.

Yield data on a series of intervarietal crosses are recorded. The following heterotic combinations are recommended: Ţigăneşti x Aurora, Odessa x Ţigăneşti, Aurora x Pritchard, Aurora x Master Marglobe, Olandeze [Netherlands] x Pritchard, 71 x Première, 71 x Bison, and for early tomatoes, Odessa x Colev and 10 x Bison.

3901 Sawant, A. C.
Semilethal complementary factors in a tomato species hybrid.
Evolution, NY 1956 : **10** : 93–96.

All the F_1 plants of the cross of *Lycopersicon esculentum* 'Pearson', carrying *sp* for the self-pruning condition and ms_2 for male sterility, with *L. hirsutum* f. *glabratum* showed a peculiar type of withering about ten weeks after sowing. Before the whole branch died, however, new shoots were produced from the base and made normal growth for some time. The F_2 and back cross to *L. esculentum* segregated in the ratio of 9 : 7 and 1 : 1 respectively for withering and normal plants. It is therefore concluded that withering was brought about by complementary genes, the ♀ and ♂ parents being assumed to have the genotypes *wwSS* and *WWss* respectively. It is suggested that these semilethal complementary factors provide a barrier to interspecific crossing in the native habitat of the genus, where *L. esculentum* is known to undergo a considerable amount of cross pollination.

3902 NAZAROV, S. P.
(Vegetative hybridization between plants of a different family).
Priroda (Nature), Leningrad 1956 : No. 3 : 95–96. [Russian].

The article, dealing with various technical aspects of grafting, mentions seed progenies of tomato / water melon, tomato / cucumber and tomato / gourd grafts now under observation at Nežin.

3903 MUNTEANU, O., TARJAN, I., PREDA, F., RADU, M. & POPOVICI, C.
O nouă metodă de hibridare vegetativă la tomate. **(A new method of vegetative hybridization in the tomato).**
Bul. Ști. Secț. Ști. Biol. Agron. Geol. Geogr. 1955 : **7** : 299–305.

By culturing the yellow-fruited variety Galben [Yellow] in a triturate of the red-fruited variety Pritchard, F_1 plants were obtained, some of which had pink or particoloured fruits.

3904 KASAHARA, J., NAKAMURA, T. & YONEYAMA, J.
(Vegetative hybridization of tomatoes).
Iwate Daigaku Nogakubu Hokoko/J. Fac. Agric. Iwate Univ. 1955 : **2** : 149–57. [Japanese].

A Russian version of this article was summarized in Abst. 1879.

3905 GLAVINIČ [GLAVINIĆ], R.
(Vegetative hybridization of tomatoes).
Agrobiologija (Agrobiology) 1956 : No. 1 : 86–91. [Russian].

In Belgrade it was found that heritable changes with regard to economic and morphological characters were transmitted by grafting. In contrast to the sexual hybrids, vegetative hybrids gave segregates in the first and maintained heterosis in later generations. The inheritance of parental characters and new characters in vegetative hybrids was analogous to that in sexual hybrids. Vegetative hybrids with dominant characters such as red fruits gave mainly progenies characterized by red fruits, but those with recessive characters (yellow fruits, entire leaves) had among their progeny plants with dominant characters (red fruits, compound leaves).

3906 BREŽNEV, D. D.
(The effect of environment upon formation of several properties and characters in tomatoes).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin. Acad. agric. Sci.) 1956 : No. 1 : 16–19. [Russian].

A number of varieties were grown at Puškin, Sverdlovsk and other places characterized by different climatic and soil conditions. Data showing correlation between environment on the one hand and growth period, number of loculi, chemical composition and heritable yield characters on the other are presented.

3907 RICK, C. M. & SAWANT, A. C.
Factor interactions affecting the phenotypic expression of the jointless character in tomatoes.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 354–60.

Previous investigators have reported linkage between *j* for jointless pedicels and *lf* for leafy indeterminate inflorescence (cf. *PBA*, VI, Abst. 1431). On the basis of their own failure to detect recombination between the two characters and other considerations, the authors suggest that both conditions are the result of the pleiotropic action of *j*. The jointless condition in three other single-gene mutants non-allelic to *j* is completely associated with leafy inflorescence. The character of jointless pedicel would be especially valuable as a means of minimizing the loss of fruits which drop when the plants are cut and lifted by mechanical harvesters. The undesirable leafiness of *j* inflorescences is reduced by *sp* (self pruning). The tightness of fruit attachment in *j* phenotypes may also be reduced by interaction with genes from other stocks, as shown by the behaviour of hybrids between large-fruited *j* lines and small-fruited jointed selections of the San Marzano type.

3908 SNYDER, R. J. & LARSON, R. E.
Quantitative inheritance of seed size in a cross between *Lycopersicon esculentum* and *L. pimpinellifolium*.
Bull. Pa. agric. Exp. Sta. 1955 : No. 607 : Pp. 24.

A study of the inheritance of seed weight was made in a cross between the small-seeded *L. pimpinellifolium* variety Saipan and the large-seeded *L. esculentum* variety Pennorange, the latter being a homozygous recessive for chromosomal markers lying on chromosomes 3, 5 and 7. Using methods of estimating and allowing for environmental effects and of eliminating differences due to maternal influences on seed weight, it was shown that seed weight was quantitatively inherited, being determined by a large number of factors with an additive effect and an apparent absence of heterosis. There was evidence that some of the factors were carried by chromosomes 3, 5 and 7. Saipan was homozygous and Pennorange heterozygous for seed size factors. Plants grown from medium-sized Saipan seeds or large Pennorange seeds gave higher early yields than those from smaller seeds, but the hybrids showed no association between earliness and seed size, nor was total yield associated with seed size. Heterosis was expressed in the F_1 hybrid as an increase in early yield but not in total yield. The possibility of breeding for early yield by selection for seed size is discussed.

3909 WAGGONER, P. E. & DIMOND, A. E.
Altering disease resistance with ionizing radiation.
Phytopathology 1956 : **46** : 125–27.

This is a full account of work described in Abst. 2112.

3910 **Report on the work of the West of Scotland Agricultural College for the year ended 30th September, 1955** : Pp. 64.

It is mentioned that high-yielding selections immune from *Cladosporium* leaf mould were obtained among tomato hybrids involving *Lycopersicon peruvianum* in their parentage.

3911 SARVELLA, P.
Translocation in naranjilla, an Ecuadorian Solanaceous fruit.
J. Hered. 1956 : **47** : 19–20.

In an investigation into the causes of pollen sterility in *Solanum quitoense* ($2n = 24$), only one of the five plants examined regularly formed 12 bivalents at meiosis, 11 bivalents being found in one of the other individuals and rings of four, indicating the occurrence of an interchange of chromosome segments, in the remaining three. The nucleolus appeared to be attached to the ring of four in one of the latter plants but not in the others.

3912 LAUMONT & CHEVASSUS.
Variétés et semences sélectionnées de légumes secs. (**Pedigree varieties and seed of pulses**).
Bull. Renseign. agric. 1955 : No. 23 : 3–17.

Descriptions are given of the morphological characteristics and cultural requirements of pedigree varieties of lentil, chickpea, garden pea, broad bean and French bean recommended for cultivation in Algeria by the Maison-Carrée Plant Breeding and Seed Testing Station.

3913 HUBBELING, N.
Nieuwe aspecten omtrent de ziekteresistentie bij bonen. (**New aspects with regard to disease resistance in beans**).
StudKring. PlantVeredel., Wageningen. Versl. 1955 : **47** : 644–49.

Data are presented on the comparative resistance of a number of *Phaseolus* varieties to anthracnose, black root, halo blight, stipple streak, bean rust, common bean mosaic, yellow bean mosaic and apical necrosis. One of the inevitable drawbacks in the bean breeding programme in the Netherlands has been that, as over 20 factors are involved in conferring resistance to all the diseases listed above, breeding for resistance to a given disease in any new variety has led to the neglect of resistance to other diseases. The physiological races of *Colletotrichum lindemuthianum* found in the Netherlands have been divided into four groups, designated α, β, γ and δ. A study of the genetical basis of resistance to each group is being carried out.

3914 BERTHÉLEM, P.
Observations préliminaires sur les effets du froid sur la féverole (hivers 1953–54 et 1954–55). [**Preliminary observations on the effects of cold on the horse bean (winters 1953-54 and 1954-55)**].
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1955 : **5** : 615–31.

Observations carried out at the National School of Agriculture, Rennes, suggested that Côte d'Or [Golden Shore] has a considerably greater tolerance of frost than all other widely-grown French and English varieties.

3915 BUISHAND, T.
The crossing of beans (*Phaseolus* spp.).
Euphytica, Wageningen 1956 : **5** : 41–50.

Methods of carrying out cross pollination, with or without emasculation of the female parent, are described in detail. The best results were obtained by pollinating in spring. In crosses between *Ph. vulgaris* ♀ and *Ph. dumosus* ♂, the degree of success varied from 0 to 38%, the most successful seed parents being varieties of the parchmented type; no seeds were produced by the reciprocal crosses.

3916 Kondo, K.
(The nutritive value of French beans).
Kyoto Dagaku Shokuryo Kagaku Kenkyusho Hokoku/Bull. Res. Inst. Fd. Sci. Kyoto Univ. 1951 : No. 5 : 9–13. [Japanese].

Data are provided on the protein, carbohydrate and mineral contents of a series of Japanese and introduced varieties. Intervarietal differences in these respects were slight.

3917 Freytag, G. F., Cravioto, R. O., Guzmán G., J. & Massieu H., G.
Estudio sobre las propiedades nutritivas del frijol. I. El contenido total de proteina de los tipos de frijol. (**Study on the nutritive properties of the French bean. I. The total protein content of the bean types**).
Foll. téc. Secretaría Agric. Ganad., Méx. 1956 : No. 19 : Pp. 26.

Specimens of *Phaseolus vulgaris* collected in different regions of Mexico, together with two from Guatemala and one from Chile, were arranged into a number of morphological groups, which are described. Estimations of protein content by the Kjeldahl method showed the existence of certain correlations, the tropical group and the forms with small, round, black or white seeds having the highest protein contents.

3918 Devcic, J. & Popovich, M.
"Magnif 31" nueva variedad de poroto para chaucha. (**Magnif 31, a new variety of green bean**).
Idia 1955 : No. 96 : 24–26.

Two plants with stringless pods were encountered in a sample of the variety Poroto Milanés [Milanese bean] and by selection among the progeny of one of them a dwarf French bean distinguished by a high yield of tender stringless beans has been obtained and named Magnif 31. It matures early and seems to possess resistance to anthracnose and mosaic and is less susceptible to attack by *Bruchus obtectus* than the common varieties.

It is thought that the original stringless plants had probably arisen by natural hybridization.

3919 Hoffman, J. C. & Kanapaux, M. S.
Relation of visual color rating to chlorophyll contents of snap bean pods.
Proc. Amer. Soc. hort. Sci. 1955 : **66** : 339–44.

The results of a study of varieties and breeding lines at the Southeastern Vegetable Breeding Laboratory, Charleston, SC, indicated that determination of chlorophyll content should be of value in selecting for pod colour in snap beans intended for the fresh market or processing since this property was highly correlated with ratings for colour based on visual appraisal of the fresh or frozen pods. B2194 and Wade received the highest gradings for pod colour when fresh and frozen and had the highest contents of chlorophyll. The close similarity of the sister lines Seminole and EES 206 in visual ratings and chlorophyll content pointed to the significance of genetic factors in influencing pod pigmentation.

3920 Beneš, V.
Příspěvek k historii vzniku a metodice vyšlechtění odrůd zahradních keříčkových fazolí "Moravské Perly" a "Olomoucké zelenoluské". (**The history of the origin and the method used for breeding the garden dwarf-bean varieties Moravské Perly and Olomoucké Zelenoluské**).
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1956 : **29** : 269–76.

An account of breeding work at Olomouc on Moravské Perly [Moravian Pearl] and Olomoucké Zelenoluské [Olomouc Green-podded], together with the descriptions of the varieties themselves is given. Moravské Perly (Schreibers Frühe Wachs [Schreiber's Early Wax] ♀ x Comodore ♂) is characterized by high yield, early maturity and resistance to anthracnose. It has yellow stringless pods 15–16 cm. long which are suitable for canning and freezing. Olomoucké Zelenoluské (Comodore ♀ x Schreibers Granda ♂) is a high-yielding midseason type moderately resistant to anthracnose and has white seed and green stringless pods 16 cm. long. It is mainly for use in a fresh state, but can be used for canning.

3921 Carlsson, G.
Försök med den nya brytbönan Nimbus/51. (**Trials of the new runner bean Nimbus/51**).
Medd. Gullåkers VäxtförädlAnst., Hammenhög 1954 : Nos. 10–11 : 280–81.

Nimbus/51 (cf. *PBA*, XXIII, Abst. 3016) is resistant to *Glomerella lindemuthiana* and has outyielded comparable varieties in both the breeder's and state trials.

3922 Spencer, J. L. & Kennard, W. C.
The Tropic Wonder.
Sth. Seedsman 1956 : **19** : No. 3 : 24–25.

A productive early bean, Tropic Wonder, bred at the Federal Experiment Station, Mayagüez, Puerto Rico, from a cross between a strain of Kentucky Wonder and Alabama 1, has fibreless pods and is resistant to root-knot nematode, bean mosaic and several types of rust. It is particularly suited to tropical regions.

3923 **New Nemagreen lima bean is nematode-resistant.**
Sth. Seedsman 1956 : **19** : No. 5 : p. 55.

Nemagreen, a nematode-resistant, green-seeded bush Lima bean, was developed by the Virginia Polytechnic Institute and Oklahoma Experiment Station in cooperation with the USDA. The plant is vigorous and productive.

3924 Bowers, J. L., Bittle, C. M. & Vose, H. H.
Monarch Blackeye—a new variety of southern pea.
Arkans. Fm. Res. 1956 : **5** : No. 1 : p. 4.

Monarch Blackeye, a cowpea variety selected from material of unknown origin at the Arkansas Valley Vegetable Substation, Van Buren, Ark., matures early, has a short period of pod setting and is highly productive, equalling Extra Early Blackeye in yield.

3925 **The Mississippi Crowder.**
Sth. Seedsman 1956 : **19** : No. 1 : 46, 48.
New cowpea released.
What's New Crops Soils 1956 : **8** : No. 6 : p. 26.

Mississippi Crowder, a new cowpea developed by the Mississippi Agricultural Experiment Station from a selfed line originating from a single plant, resembles Brown Sugar Crowder in type but is resistant to race 1 of *Fusarium* wilt and tolerant of races 2 and 3.

3926 Erwin, D. C. & Thomason, I. J.
Wilt resistant blackeye beans. Results of tests in 1955 on the new Grant variety in southern California indicate Fusarium wilt resistance.
Calif. Agric. 1956 : **10** : No. 5 : p. 6.

Grant, a selection from *Vigna sinensis* 'Chino 3', resembles the parent variety in most characters, but matures two weeks later and has proved highly resistant to *Fusarium* wilt in large-scale field tests near Chino, Calif. It is, however, extremely susceptible to attack by *Meloidogyne javanica*.

3927 Hare, W. W.
New Crowder pea released; wilt resistant.
Miss. Fm. Res. 1955 : **18** : No. 12 : 1, 2.

Developed by the Mississippi Agricultural Experiment Station from a single-plant selection, the cowpea Mississippi Crowder has all the desirable characteristics of Brown Sugar Crowder and in addition resistance to race 1 and tolerance of races 2 and 3 of *Fusarium* wilt.

3928 **Here are the most widely grown varieties.**
Soybean Dig. 1956 : **16** : No. 4 : 14–16, 18.

Descriptive notes are provided on the chief varieties of soya bean grown in the northern and southern regions of the USA.

3929 Weber, C. R.
2 new and better vegetable soybeans.
Iowa Fm. Sci. 1956 : **10** : 201–02.

The vegetable soya-beans Kim and Kanrich were developed at the Iowa Agricultural Experiment Station from Sac x Richland back crossed to Sac and from Kanro x Richland back crossed to Kanro, respectively. They possess resistance to shattering and higher yields and greater plant height than the parental vegetable varieties Sac and Kanro. Their seed weight, resistance to lodging and palatability are satisfactory. Their area of adaptation is considered to be approximately the same as that of Hawkeye (cf. *PBA*, XVIII, Abst. 1295). Within this region, they are expected to be ready for use as green beans by late August or early September when planted towards the end of May.

3930 Collins, F. I. & Carter, J. L.
Variability in chemical composition of seed from different portions of the soybean plant.
Agron. J. 1956 : **48** : 216–19.

Investigations on several varieties at the US Regional Soybean Laboratory, Urbana, Ill., revealed that chemical composition of the seeds varied with the positions of the pod on the plant and raceme and with the position of the seed in the pod. When the plants were divided into four portions from top to bottom, the seed from the two lower parts was about 0·5% higher in oil and 1% lower in protein content than seed from the two upper portions. When seeds from single nodes were analysed, it was found that the indeterminate type produced seed with the highest content of oil at the central and lower nodes and plants of the ordinary determinate type tended to produce seeds nearly similar in oil content at all nodes. The dwarf determinate variety Jogun formed seed with the highest oil content on the terminal raceme. As shown by data on Lincoln and Hawkeye, although high and low yielding plants had similar patterns of distribution of oil content, higher yield was associated with higher oil content. In D49–2477 and other strains with a long terminal raceme beans from near the tip of this raceme had lower oil content than those produced further down. Analysis of Lincoln indicated that within a single pod the seed from the tip had the highest oil content and lowest protein content; the differences between seeds were not however large. The bearing of these results upon procedures of selection is indicated.

3931 Klykov, A. P.
(New forms of soya bean from seeds which swell slowly on soaking).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 1 : 13–15. [Russian].

At Rjazanj the seed of Harbin 231a and Kubanj 4958 originating from Krasnodar was selected for slow swelling on soaking. Those seeds which took at least 4 hr. gave rise to the best progenies. They showed variability with regard to economic and morphological characters and a number of forms distinguished by great vitality, resistance to bacterial infection and adapted to cultivation in the Nonchernozem Belt were selected.

3932 Suhovecky, A. J.
A *Phytophthora* root rot of soybeans.
Diss. Abstr. 1955 : **15** : Publ. 14,500 : p. 1991. (Abst.).

Of the four soya bean varieties recommended for Ohio, only Monroe was resistant to a *Phytophthora* root rot found in the north west of the state. OH–53, a selection from the susceptible variety Bavender, was also resistant.

3933 Whitehead, M. D., Matson, A. & Williams, L.
Severe root-knot nematode infection of the soybean variety Lee.
Plant Dis. Reptr. 1956 : **40** : p. 176.

Lee is considered to be resistant to several diseases, including root knot due to *Meloidogyne incognita* var. *acrita* (cf. *PBA*, XXIV, Abst. 3483 and XXV, Abst. 616). It has however shown susceptibility to *M. arenaria* at Hornersville, Dunklin County, Mo.

3934 Lamprecht, H.
Studien zur Genenkarte von Chromosom I von *Pisum.* **(Studies on the gene map of chromosome I of *Pisum*).**
Agri hort. genet., Landskrona 1956 : **14** : 66–106.

The results of previous studies of linkage values in chromosome I are surveyed and combined with data from 34 new crosses to give a gene map showing the distances between the 12 known linked loci. These lie in the order *A-Vi_1-Au-Lf-D-Pur-Cor-Am-O-Sp-Red-I*, the positions of *Cor* and *Am* relative to each other being uncertain. As in previous studies, variation in crossing-over value was greatest in genes near the ends of the chromosome (cf. Abst. 2947).

3935 Lamprecht, H.
Zur Artberechtigung von *Pisum elatius* Stev. und *Jomardi* Schrank. **(On the specific status of *P. elatius* Stev. and *P. Jomardi* Schrank).**
Agri hort. genet., Landskrona 1956 : **14** : 5–18.

The high fertility, the segregation ratios and the linkage relationships observed in crosses between *P. elatius* and *P. jomardi* on the one hand and lines of *P. arvense* in which linkage relationships were known for all seven chromosomes on the other indicate that the three specific names may be regarded as synonymous. It is also shown that characters often regarded as specific for the two first-named species fall within the range of variation of *P. arvense.*

3936 Gelin, O. E. V.
Problems relating to plant breeding by means of mutation.
Agri hort. genet., Landskrona 1956 : **14** : 127–36.

After a survey of work on X-ray induced mutations in barley (cf. Absts. 1303 and 3301) and pea (cf. *PBA*, XXV, Abst. 168 and XXVI, Abst. 3937), current work on peas is mentioned. Crosses between the mutant Gigas and its parent Parvus show evidence of a maternal influence on growth rate, Parvus x Gigas having a higher growth rate than the reciprocal but the same final size; heterosis with respect to both characters is found in both hybrids. The number of genes affected by the mutation from Parvus to Gigas is under investigation; so far, it appears that 1000-seed weight and pod size in Parvus are each influenced by at least two mutated genes. Three semidwarf plants with short internodes have been found in the offspring of a single X_1 plant of Parvus.

3937 Gelin, O. E. V. & Blixt, S.
The karyotypes of two X-ray mutants in peas and their ancestors.
Agri hort. genet., Landskrona 1956 : **14** : 148–60.

Measurements of the ratio of the two chromosome arms and of the length of each chromosome expressed as the percentage of the total length of all 14 chromosomes were made on Kloster [Cloister], Parvus and their respective X-ray mutants Strål [Ray] and Gigas. In Parvus and Gigas the constrictions in chromosomes III and VI were more nearly terminal than in the other two lines; it is thought that the difference resulted from an interchange between these chromosomes in either Parvus or Kloster, or possibly in one of the common ancestors of the two varieties, viz. Ambrosia and Monopol. No caryotypic difference was observed between Kloster and Strål, but Gigas differed markedly from Parvus in having a more nearly terminal constriction in chromosome I, possibly as a result of an inversion including the centromere and part of one or both arms.

3938 Lamprecht, H.
Pisum sativum L. oder *P. arvense* L. Eine nomenklatorische Studie auf genetischer Basis. (***P. sativum* L. or *P. arvense* L. A nomenclatural study on a genetical basis**).
Agri hort. genet., Landskrona 1956 : **14** : 1–4.

From a survey of taxonomic literature on the above two species and of historical records of the cultivation of peas it is concluded that, while wild forms of *P. arvense* are known, *P. sativum* has never occurred in the wild state but arose, probably in medieval times, through a mutation to white flowers and large seeds ($A \rightarrow a$) in a cultivated form of *P. arvense*. Further mutations governing stem length ($Le \rightarrow le$), pod tenderness ($V \rightarrow v$) and wrinkled seed ($R \rightarrow r$) are thought to have occurred later. It is suggested that all the above-mentioned peas be regarded as members of the species *P. arvense* and that the varietal name *sativum* be reserved as a collective term for all white-flowered cultivated varieties. The variety *hortense* is regarded as a later synonym of *sativum*.

3939 Kiss, Á.
Ernősborsó keresztezési kísérletek. (**Experiments on crossing umbellate peas**).
Növénytermelés 1955 : **4** : 3–24.

In crosses made with the aim of transferring the stiff straw and uniformity of maturation of peas with fasciated stems and umbellate inflorescences to commercial varieties, fasciation acted sometimes as a recessive and sometimes as a dominant character. Some of the élite hybrids had attained stability by the fifth generation. The number of seeds per plant was higher in the F_1 than in the parents but varied widely in the F_2 and succeeding generations.

3940 Lamprecht, H.
Die Koppelung des Gens *Cal* für Teilfarbigkeit der *Pisum*-Samen. (**The linkage of the gene *Cal* for partial coloration of *Pisum* seeds**).
Agri hort. genet., Landskrona 1956 : **14** : 34–44.

The results of a cross involving 19 genes, most of which govern pod and seed characters, confirm earlier data showing that 16 of them lie on chromosomes I, II, III, IV, V and VI. Of the other three genes, *Cal*, which in the presence of *z*, *mp* and *dem* determines partial coloration of the testa, is situated near *Cp* at the left end of chromosome V and *pal*, which lightens the colour of the testa, appears to be linked with *B*, *St* and *Rf* on chromosome III; the linkage relationships of the new gene *Cpa*, which together with *Cp* gave the F_2 segregation ratio 15 straight pods : 1 curved pod, have not been determined.

3941 Lamprecht, H.
Über Wirkung und Koppelung des Gens *Tram* bei *Pisum*. (**On the effect and linkage of the gene *Tram* in *Pisum***).
Agri hort. genet., Landskrona 1956 : **14** : 45–53.

The gene *Tra*, previously regarded as a recessive gene *tram* (cf. Abst. 2953), determines the secretion of a layer of tragacanth on the inner wall of the testa and the appearance of green (*i*) or yellow (*I*) spots of tragacanth in the seed coat. In the heterozygous condition, less tragacanth is produced and the spots are indistinct. It is shown that *Tra* lies between *Fa* and *Td* on chromosome IV, the probable order of the ten known genes of this linkage group being *N-Z-Fo-Fa-Tra-Td-Con-Br-Lc-V*; the order of *Fo-Fa* and of *Td-Con* is not yet certain.

3942 Lamprecht, H.
Zum Auftreten von *obscuratum*-Samen bei *Pisum*. (**On the occurrence of *obscuratum* seeds in *Pisum***).
Agri hort. genet., Landskrona 1956 : **14** : 19–33.

The *obscuratum* character, in which the anthocyanin normally occurring as spots or stripes on the seed becomes continuously spread over testa, occurs frequently in plants grown in the sun but is absent in shade plants. The character is expressed only in lines carrying one of the dominant genes *F*, *Fs* or its allele Fs_{ex} and U_{st}, each governing testa coloration, or the complementary genes *Pur* and *Pu*, which together give purple pods, or any combination of these. The gene *gp*, the action of which results in a lowering of vigour and seed yield, appears to have a distinct inhibiting influence on the expression of the *obscuratum* character; *v*, which also depresses vitality, has a similar but less marked effect.

3943 Das, D. P., Siddappa, G. S. & Girdhari Lal
Canning of dried peas: variety trials.
Indian J. Hort. 1955 : **12** : 80–84.

Of the six varieties tested at the Central Food Technological Research Institute, Mysore, Marrowfat I and Marrowfat II were found to eb the most suitable for processing.

3944 Hubbeling, N.
Resistance to top yellows and Fusarium wilt in peas.
Euphytica, Wageningen 1956 : **5** : 71–86.

The symptoms and means of spread of the above two pathogens are described and an alphabetical list of numerous pea varieties and their reactions is provided. Since no reliable simple method of testing for resistance to top yellows is known, it is suggested that material for testing be exposed to natural infection by sowing in April or May in the vicinity of lucerne or other fields already infested with a vector aphid. Resistance appears to be determined by one or more dominant genes. Line selection should be carried out until no further segregation of susceptible plants occurs and it is recommended that, in crossing, both parents should be resistant. Testing for resistance to *F. oxysporum* is readily effected by sowing in infected soil. Resistance is due to a single dominant factor and suggested breeding methods are (1) line selection, (2) back crossing to introduce resistance into commercially desirable material and (3) hybridization between two resistant lines. Breeding for combined resistance to the two pathogens is recommended.

3945 Priadcencu, A. & Ionescu, D.
Un nou soi de linte bun pentru Moldova. (**A new variety of lentil which does well in Moldova**).
Anal. Inst. Cerc. agron. Român. 1952–1953 (1955) : **22** : No. 3 : 663–70.

Data on the yield, grain size and protein content of a series of strains selected at Iași are presented. A description is given of the strain Iași 9, recommended for northern Moldova, Transylvania and Banat.

3946 Delestaing, N.
Contribution à l'étude cytologique du genre *Salvia*. (**Contribution to the cytological study of the genus *Salvia***).
Rev. Cytol., Paris 1954 : **15** : 195–235.

Meiosis, mitosis and the appearance of the interphase nucleus were studied in 32 species and chromosome counts and chromosomal measurements were made for the 27 of these which had not previously been counted. From the data obtained, together with the results of other workers, the following series of basic chromosome numbers was established for the genus: $x = 6, 7, 8, 9, 10, 11, 13, 14, 15, 17$ and 19. Meiotic abnormalities were observed in many cases.

BOOK REVIEWS

Tippett, L. H. C.
Statistics.
Oxford University Press, Cumberlege : London 1956 : 2nd Ed. : 7s. 6d. : Pp. vi + 224 : 17 figs. : 15 tables.

The second edition of this book differs from the first in its choice of illustrative material and reference to ideas and methods developed since the war. The result is the best introduction to statistical science for the general reader. Within a short space and without the use of mathematical symbolism the author describes the scope of statistics, develops several of its elementary techniques and indicates the more specialized developments. The ideas in this book should be part of the "culture" of every scientist and provide an excellent prelude to the study of more advanced methods, on which the author gives some useful advice.

Federer, W. T.
Experimental design.
Macmillan Co., New York and London 1955 : 77s. : Pp. xix + 544 + 47 tables.

This is a useful book for those thoroughly familiar with the basic ideas of statistical method, and with the use of the simpler experimental designs for situations in which statistical variation is present. A fairly mature mathematical level is assumed. The book contains an account of almost all the standard designs and their analyses. A great amount of detail is included and this, though in itself a virtue, often leads to the situation that the fundamental ideas are obscured.

FISHER, R. A.
Statistical methods and scientific inference.
Oliver & Boyd, Edinburgh 1956 : 16s. : Pp. viii + 175 : 5 figs.

The two previous books on statistics by the author have been concerned with practical problems in the analysis of numerical data and in the design of experiments. The mode of exposition adopted was principally by means of examples and little attention was paid to the logical bases of the ingenious and revolutionary ideas advocated: an appropriate course in the circumstances. In the new work an attempt is made to remedy this omission and "an examination of the logical nature of uncertain inference . . . is provided". Unfortunately the exposition is still through examples, so that general principles, which are so important in a study of this sort, though not so necessary in practical problems, are obscure. Pertinent criticisms that have been made by several writers of the author's methods are ignored, and the amount of invective directed against others unnecessarily high. Those concerned with the foundations of statistics will be grateful to the author for providing further material on which to attempt to provide a logical basis for his methods: the basis is certainly not provided by the book under review.

PANSE, V. G. & SUKHATME, P. V.
Statistical methods for agricultural workers.
Indian Council of Agricultural Research, New Delhi 1954 : Rs. 15 : Pp. xvi + 361 : figs. : tables.

The authors' aim is "to provide an elementary textbook for the use of agricultural research workers whose mathematical attainments are modest". They have been successful. The book is in two parts: statistical methods (136 pages), and design of experiments (200 pages). The first deals with the basic ideas of statistics; frequency distributions, sampling methods, significance tests, regression etc. The second describes the usual designs and their analyses and has chapters on plant breeding trials, groups of experiments and practical considerations. There are appendices containing the commoner statistical tables and notes on computation. The authors' development is along orthodox lines and takes little account of postwar developments. This has the merit that the techniques described have been thoroughly tested in the field and been found useful. Though only a little mathematical knowledge is required, extensive use is made of mathematical symbolism. There is a wealth of practical illustrations. The authors make several mistakes (for example a wrong definition of consistency on p. 40, and the attribution to the method of maximum likelihood of properties which it does not possess on p. 96) but these are not likely to trouble the practical worker unduly: he will find the book an excellent introduction to the use of statistical ideas. It is perhaps the best in its field.

GOLDSCHMIDT, R. B.
Portraits from memory. Recollections of a zoologist.
University of Washington Press, Seattle : 1956 : $3.50 : Pp. ix + 181 : Plates.

Richard B. Goldschmidt is one of the few survivors of the cultural world represented by Germany at the end of the nineteenth century and this personal picture of it will serve to evoke an impression of that world to generations of scientists who have not even experienced its flavour. Graphic pictures are conjured up of some of the great scientific men of history: Haeckel, the ardent apostle of Darwinism on the Continent of Europe, picturesque figures such as Kuno Fischer who recited the whole of Goethe's *Faust* at his lectures "apparently incidentally", Otto Bütschli, the father of cytology and first observer of mitosis and the process of fertilization, the vain Wilhelm Roux, the brothers Hertwig who did the first systematic experiments on fertilization and cleavage in sea urchins, Theodor Boveri who first elucidated the movements of the chromosomes and their significance in heredity, Fritz Schandinn, discoverer of the spirochete causing syphilis, Karl Bělař who lost his life in the early thirties because he mixed his enthusiasm for cytology with a passion for reckless motoring, and a host of other interesting and original figures. One of these is P. Kammerer with his "proofs" of the inheritance of acquired characters, who receives very short shrift and is classed with the "remarkable and hard-to-understand group of big fakers" which includes the authors of the Vermeer fakes and of the Piltdown man.

Many interesting sidelights are thrown on the customs of the world described. Thus we learn that the few female students were mostly Russians, that the author was reprimanded for late arrival on coming to the laboratory at eight in the morning but that complete academic freedom prevailed in the universities, where "there was no university administration to invent orgies of red tape with three thousand blanks in all colours of the rainbow to be constantly filled, filed, and forgotten. There were no committee meetings except the academic senate. There were no secretaries, typewriters, stenographers, or reports, except the annual budget-making, and the bookkeeping was of the most primitive, household type". On the other hand the bureaucracy in the Imperial Health Office was much more reminiscent of our own day and Ladislaus von Prowazek was required to return the empty boxes of his cover glasses from the Dalmatian coast to Berlin in order to get supplies of new ones!

DEMEREC, M. (Editor).
Advances in genetics. Vol. VIII.
Academic Books Ltd., London 1956 : $9.00 : Pp. ix + 402 : figs. : tables.

The new volume of this series (cf. p. 123 above) again contains several contributions of interest to plant geneticists. In Metabolism and spontaneous mutations in plants, F. D'Amato and O. Hoffmann-Ostenhof examine the various cases in which mutability has been increased by factors such as aging and by extracts from plant tissues, including those from aging seeds, and many chemicals known to be present in plants; they put forward the view that the accumulation of automutagenic substances in aging seeds is responsible both for their rise in mutability and ultimate loss of viability and that some at least of the effects of irradiation may be attributable to these substances. In The complementary genic systems in flax and flax rust, H. H. Flor gives a brief review of what is known on resistance to *Melampsora lini* in flax, on the biology of the parasite and its physiological specialization, and on the inheritance of pathogenicity, of resistance and of host-parasite interaction. It is concluded that for each gene conditioning reaction in the host there is apparently a specific gene for pathogenicity in the parasite, resistance in the host being dominant and virulence in the parasite, with one exception, recessive; 27 varieties have been developed, each of which apparently possesses a single gene for reaction to North American races. The rust-conditioning genes in flax occur as multiple alleles and lie at five loci, of which three appear to be independently inherited and two linked. Thus, five genes for rust reaction can be incorporated into a flax plant. No linkage has been observed in the genes determining virulence in the rust; by utilizing the selective pathogenicity of races of rust, Bison-like varieties possessing nearly any desired combination of rust-resistant genes, within the limits of allelism, may be developed. V. Grant, in The genetic structure of races and species in *Gilia*, gives an analysis of what is known concerning interspecific relationships in various genera of the Polemiaceae, particularly *Gilia*, *Allophyllum* and *Polemonium*. The conclusions are of significance for the species question as a whole and are summed up by the author as follows. Many types of genetic systems, simple Mendelian factors, polygenic systems, specific plasmons, sterility factors and the caryotype, plus external isolating systems, enter into the genetical structure of species. It may not be adequate even to equate the species with the sum total of these elements, since this entity behaves as a level of integration in its own right. Yet the species does not appear to be qualitatively different in any fundamental way from the race. The same types of genetic systems and isolating mechanisms which differentiate species are also found, if not in full-fledged development, at least in rudimentary form, between races. If the species represents a higher level of organization, therefore, it is one which can be attained by gradual processes of evolution from the level of the race. The same author deals with Chromosome repatterning and adaptation, showing how structural changes of the chromosomes may affect the system of heredity, variation and evolution in several ways, through hybrid sterility, linkage of gene complexes, the perpetuation of heterozygotic and heterotic combinations of such gene complexes, the addition of new loci to the complement and position effect. This would seem to account for their relative frequency in wild populations and the closer evaluation of their roles in different groups of organisms is regarded as a promising field for further study. The longest contribution in this volume is that on Cytogenetics of tomato, by C. M. Rick and L. Butler, occupying 115 pages; a review is given of the literature on geographical distribution, origin and domestication and cytology; the mutant genes at present known are enumerated, their effects described and their linkage relationships summarized; studies on polyploidy and interspecific hybrids are treated next, and there follows an extensive section devoted to the inheritance of quantitative characters, heterosis, mutation and biochemical genetics; in the section on graft relations a number of works are reviewed which failed to confirm the affirmations of the Soviet school of agrobiologists as regards the hereditary transmission of the effects arising from grafting. Cytoplasmic inheritance is the last subject treated and the review terminates with some general remarks in which the evidence is found to be in favour of the assumption that $2n = 24$ is the basic diploid condition in the *Lycopersicon* spp. and the many features that make tomatoes suitable material for cytogenetic research are analysed.

Colin, E. C.
Elements of genetics.
McGraw-Hill Book Company, Inc., New York, Toronto & London 1956 : 3rd Ed. : 43s. : Pp. xv + 498 : 152 figs. : 25 tables.

The third edition of this work follows the lines of previous editions (cf. *PBA*, XVII, p. 350), though certain sections have been enlarged or revised. Thus the section on multiple alleles now constitutes a separate chapter; the chapters on heredity in man have been placed after that on evolution; and two new chapters have been added, on domesticated plants and animals respectively. The former of these gives a very brief summary of what is known concerning the origin, botany and genetics of economic characters for ten of the main crop plants, viz. wheat, oats, barley, maize, rice, pea, tomato, cotton, coffee and tobacco. A translation of Mendel's autobiography, covering a little under two printed pages, and a section comprising laboratory exercises for the student have also been added. A somewhat more elegant lay-out has been adopted and the price increased to $5.75.

Sirks, M. J.
General genetics.
Martinus Nijhoff, The Hague and B. T. Batsford Ltd., London 1956 : 5th Ed. : 30 Flor. : Pp. 628 : 238 figs. : 5 plates.

The fifth edition of Dr. Sirks's *Handboek der algemene erfelijkheidsleer*, reviewed in *PBA*, XXII, p. 311, has now appeared in an English edition. The translators have translated the text accurately, though not always the punctuation, and such expressions as "if all phenotypical groups, which one could expect, were present" occur frequently. The names of classical authors such as Aristotle are not anglicized and there are a certain number of non-English expressions such as "winning seed" "the pangenesis", "this data", "principles led down", "off-spring", and "budvariations". Certain other errors, such as the misrepresentation of the name Bělař, have been inherited from the Dutch original. A few very brief additions have been made in the text and a small number of references added but the main interest of the work for international readers is in its presentation of a full account of the development of the science of genetics in the early years.

Li, C. C.
Population genetics.
University of Chicago Press 1956 : 75s. : Pp. ix + 366 : 82 figs. : 82 tables.

Dr. Li is one of the most eminent members of the Chinese school of population geneticists. Originally a lecturer at Nanking and Peking universities, he left China in 1949 after the Chinese Lysenko controversies in that year and has since worked in the USA.

The present volume is an extension of an earlier book published in Peking in 1948. It brings together in convenient form a comprehensive collection of mathematical theorems relating to population genetics. The treatment follows closely the classical papers of Fisher, Haldane and Wright. After a preliminary exposition of panmixia, the significance of genetic variance and correlation is analysed. The extensions to panmictic theorems required by multiple alleles, sex linkage and polyploidy are then described. Inbreeding systems are the subject of the following chapters, special emphasis being laid on the method of path coefficients for solving problems in inbreeding. The chapters towards the end of the book deal with gene frequency distributions as affected by mutation, selection, migration and population size.

Dr. Li's book should prove of considerable value as a reference book to geneticists already more or less familiar with mathematical genetics. It takes rather too much prior knowledge for granted to be a suitable introduction to the subject and provides only a sketchy account of such basic concepts as genetic variance. The value of the book for general readers would probably be enhanced by a reduction in the exercises at the end of each chapter and a clearer exposition of fundamental principles.

A discussion on the dynamics of natural populations. Arranged by E. B. Ford.
Proc. roy. Soc. : Ser. B. : 1956 : 18s. : **145** : No. 920 : 291–364.

Part of this issue consists of papers contributed to the above discussion, held on 8 December 1955. The symposium provides a useful survey of some of the studies of variation and evolution in natural populations undertaken in recent years in Great Britain. E. B. Ford contributes the introduction. After commenting broadly on the progress achieved in the investigation of microevolutionary changes in natural populations in both plants and animals and on the significance of fluctuations in numbers, polymorphism and isolating mechanisms, he suggests that the establishment of isolated populations of known size and genetical constitution under natural conditions offers a promising but as yet little exploited method of analysis. In Polygenic mutation and variation in populations, K. Mather argues that the genetic homeostasis and advantage of heterozygotes in fertility and in stability of development, characteristic of polygenic systems in outbreeding organisms, may be interpreted in one of two ways: as properties innate in the genes themselves which show pleiotropy in their effects and overdominance in interaction, or as properties imposed upon the system by the organizing and balancing action of natural selection. According to the first view, variation ultimately owes its origin to mutation; recent experiments on polygenic mutation in *Drosophila* have provided support for the second hypothesis. H. B. D. Kettlewell in A résumé of investigations on the evolution of melanism in the Lepidoptera suggests that the melanism developed by moths in areas of industrial pollution represents an example of transient polymorphism. J. B. Haldane supplements this paper by The theory of selection of melanism in Lepidoptera and an appendix on The selection of modifiers of heterozygotes, in which he examines by mathematical methods some problems concerning the rates of selection of heterozygotes and homozygotes for the dominant gene *C* for melanism in *Biston betularia*. The next contribution, The relation between density regulation and natural selection, also comes from J. B. S. Haldane who succinctly considers the role of various density-dependent and density-independent factors as agents of natural selection, mainly with reference to animals. P. H. Sheppard, in Ecology and its bearing on population genetics, describes investigations on fluctuations in population size of two colonies of *Panaxia dominula*; artificial colonies of this moth are shortly to be established. D. H. Valentine illustrates variation and polymorphism in flowering plants by a paper on *Viola*, with particular reference to *V. riviniana*. This tetraploid ($2n = 40$) reproduces not only by means of open and cleistogamous flowers but also by the production of adventitious shoots, a characteristic controlled by two dominant major genes; plants with and without the capacity of reproducing vegetatively are widely distributed in fairly equal proportions in British populations. Variation in the occurrence of supernumerary chromosomes has also been detected and it has been noted that only those plants with extra chromosomes reproduce vegetatively. Natural hybridization with other species has occurred, a point of interest being the observation that when the *V. riviniana* parent is the vegetatively reproducing type this character is transmitted to the hybrids. J. S. Huxley in Morphism as a clue in the study of population dynamics gives examples of genetic polymorphism among plants and animals and emphasizes the dual value of morphic forms as markers providing qualitative as well as quantitative information on selection within a population. The next paper returns to the insects: Isolation and adaptation in populations of the Lepidoptera by W. H. Dowdeswell, and deals with the butterfly *Maniola jurtina*. Ecological studies on Variations in the reproductive rate of birds are described by D. Lack. In Adaptation and ecotypic components, J. W. Gregor suggests that ecotypically differentiated populations of plants may be less specialized than is generally assumed. In referring to the capacity of some genotypes to survive in a range of environments without marked phenotypic change, he mentions a strain of *Poa pratensis* derived from an 81-chromosome apomictic plant found on the Oregon coast and showing remarkable vigour in widely different environments in the USA and Europe. In Genetic response to selection in cultivated plants: gene frequencies in varieties of *Prunus persica*, W. Williams and A. G. Brown analyse the frequencies of phenotypes determined by alleles at the four major loci for foliar glands (*G*), flesh colour (*Y*), corolla size (*R*) and the nectarine mutant (*n*) respectively, in relation to the quantitative characters of time of flowering and season of maturation. They find that the allelic frequencies at these apparently adaptively neutral loci vary according to the two physiological characters, that the joint frequencies of alleles at two loci also exhibit a differential response according to the season of ripening and that pleiotropic effects can be identified in the case of at least two of the loci. It is suggested that under certain conditions such pleiotropic effects could determine a selective response of the locus concerned. Discounting linkage of major loci with groups of polygenes as a satisfactory explanation of these results and of others reported in the literature on various organisms, the authors conclude that a state of neutrality among major loci is rare, and that such genes usually exert secondary effects on quantitative characters by reason of the part they play in the balance of the genotype as a whole. A. B. Acton in Chromosomal polymorphism in *Chironomus* discusses the survival value of paracentric inversions. C. D. Darlington completes the discussion with Natural populations and the breakdown of classical genetics, in which he reveals the inadequacies of classical genetics in explaining variation and, mainly with reference to plants, offers an approach to the required analysis of populations in terms of the interactions of chromosome behaviour, reproductive habit and environmental conditions.

THOMAS, M.
Plant physiology.
J. & A. Churchill Ltd., London 1956 : 4th Ed. : 45s. : Pp. xii + 692 : 89 figs. : 25 tables.

The first edition of what is often regarded as the best text book on plant physiology was published in 1935. The second edition, reviewed in *PBA*, Vol. XI, p. 142, came out in 1940 and the third in 1947. The present edition, which has been extensively rewritten, has been produced in collaboration with Dr. Ranson and Mr. Richardson, both members of Prof. Thomas' Department of Botany at Newcastle upon Tyne.

The major change is the expansion of the chapter on enzymes to five separate chapters dealing respectively with enzymes in general, hydrolytic and transferring enzymes (by Dr. Ranson), the zymase complex, oxidation and reduction, and the Krebs cycle. The omission of a section on photoperiodism and vernalization, commented upon in our review of the second edition, has been rectified by a new chapter written by Mr. Richardson. A new appendix on special techniques, in particular chromatography, ion exchange techniques and isotope tracers, has been prepared by Dr. Ranson.

This new edition is likely to maintain the position of this publication among the forefront of text books on plant physiology.

BLINKS, L. R. (Editor).
Annual review of plant physiology. Vol. 7.
Annual Reviews, Inc. Palo Alto, California, USA 1956 : $7.00 : Pp. 456 : figs. : tables.

The seventh volume of this series contains seventeen contributions, most of which have direct or indirect bearing upon plant breeding, genetics and cytology (cf. *PBA*, XXV, p. 633). H. Stern in a review on the physiology of cell division discusses mitosis in plants and animals in terms of three levels of organization, viz. the multiplication of the cytoplasmic components and chromosomes, intracellular activities in the dividing cell as a whole, and intercellular relations. Those engaged in breeding for disease resistance are likely to be particularly interested in two of the contributions: Obligate parasitism by C. E. Yarwood and Biological relations of plant viruses by C. W. Bennett. Among the topics dealt with in the first of these papers are possible approaches to the problem of culturing obligate parasites, and the role of evolution, adaptation and mutation in fungal modes of life. The second paper is concerned with ways of entrance of viruses into plants, the tissues invaded, seed transmission, rates and paths of virus movement, and classification of plant viruses on a biological basis. Photoperiodism in woody plants by P. F. Wareing is devoted mainly to forest-tree species and brings out the importance of this factor in the differentiation of ecotypes and in introduction and breeding. E. H. Toole *et al.* review literature on the Physiology of seed germination. J. G. Torrey contributes a paper on the Physiology of root elongation. In Plant proteins, C. E. Danielson has selected some special problems for discussion: classification of these proteins; the homogeneity of seed proteins; seed globulins as dissociating systems; the effect of climate and other factors on the composition of the plant proteins; and seed proteins during germination and ripening. A. L. Karsanov, of the Timiriazev Institute of Plant Physiology, Moscow, contributes a survey on Recent advances in plant physiology in the USSR, which should attract wide interest. The bibliography contains 400 references. The inclusion of a paper by a Russian scientist is a new feature. The remaining papers are as follows: Mineral nutrition of plants: mechanisms of uptake and transport by E. Epstein; Energy transformations in photosynthesis, L. N. M. Duysens; Nitrogen fixation by photosynthetic organisms, G. E. Fogg; Endogenous rhythms in plants, E. Bünning; Iron chlorosis, J. C. Brown; Mechanisms of carbohydrate breakdown in plants, B. Axelrod and H. Beevers; Phosphorus metabolism and photosynthesis, D. I. Arnon; Absorption and translocation of plant regulators, J. van Overbeek; and Effects of light quality on plant growth by E. C. Wassink and J. A. J. Stolwijk.

WELLS, J. S.
Plant propagation practices.
Macmillan Co., New York and London 1955 : 42s. : Pp. viii + 344 : 55 figs. : tables.

Methods of propagating woody perennials on a large scale form the subject matter of this volume. Mr. Wells is well known for his work on such techniques of propagation as constant mist and hormone treatment and his wide practical experience is apparent in every page of this work. The book is divided into four parts. The first is concerned with the choice of a site and suitable equipment and building; the second deals with the interaction and control of heat, light and water; the third describes methods of propagation from seed, from cuttings and by grafting, layering and division, particularly detailed treatment being given to the various techniques by which rooting of cuttings may be promoted; and the last part gives details of recommended propagating procedures for 18 individual groups of plants.

The lucidity of the author's explanations and descriptions and the detailed and sound advice presented will recommend this book to the practical horticulturist for whom it is intended, but the arm chair gardener will also find that the easy, readable style and the author's evident pleasure and interest in his subject make it agreeable browsing matter.

An appendix listing the sources, mostly in the USA, of commercial products and the literature mentioned in the text and a good index complete the volume.

KLOKOV, M. V. & VISJULINA, O. D.
(**Flora of the Ukrainian SSR**).
Akad. Nauk. URSR, Kiïv 1955 : **7** : Pp. 657 : 111 figs. [Ukrainian].

The seventh volume of the flora of the Ukraine (cf. p. 126 above) comprises the families from the Geraniaceae to the Cornaceae, inclusive.

BISSET, K. A.
The cytology and life-history of bacteria.
E. & S. Livingstone, Ltd., Edinburgh 1955 : 2nd Ed. : 25s. : Pp. xii + 164 : 68 figs.

Since the first edition of this book appeared in 1950 there have been considerable advances in techniques of bacterial cytology, notably in the use of thin sections in electron microscopy and in the use of specific enzymes and antibodies in the preparation of material for phase-contrast microscopy, and improved demonstrations of gonidial reproduction, the development of flagella and other processes have been achieved. This and much other new information has been incorporated in this new edition, in the form both of additions to the text and of many new and remarkably fine illustrations.

The work begins with an account of the techniques available for the cytological examination of bacteria and their respective advantages and drawbacks. There follow descriptions of cell walls, cell division and such surface structures as flagella, slime layers and capsules. The chapter on the bacterial nucleus, which follows, discusses in some detail the varied appearance of the nuclear material at different stages in the life history and some of the artefacts described in the literature, and further chapters are concerned with reproduction, sexuality and life cycles, the extreme complexity of the latter in *Azotobacter* and *Rhizobium* receiving special attention. In a short discussion of the evolutionary relationships of the bacteria, Dr. Bisset arrives at the conclusion that the most primitive types are the spirilla, which have characters intermediate between those of typical bacteria and those of flagellates; terrestrial bacteria with special mechanisms for the aerial distribution of their resting stages are regarded as the most highly evolved. A final chapter indicates how genetical evidence has confirmed the conclusions reached by cytology on nuclear reproduction and sexuality in bacteria.

MÜHLE, E.
Rostpilze. (**Rust fungi**).
Die neue Brehm-Bücherei, Wittenberg 1956 : DM 2.25 : Pp. 39 : 38 figs.

This concise portrayal of the life history and morphology of the Basidiomycetes is written for the layman ignorant of the biology of these interesting organisms and lays no claim to being a highly erudite work. The author deals firstly with the systematics of the rust fungi, their life cycle and the crops they infect and sketches briefly the evolution of the wide complex of modern rusts from a putative ancestral form that, some 200–250 million years ago, infected ferns. The descriptions are accompanied by numerous well drawn diagrams and charts illustrating the succession of forms in a single life cycle. A number of sketches illustrating the infection of various crop plants by rust are also provided. In the chapter which deals with control measures, the author lists various chemical treatments that have proved efficacious with different crops and discusses the breeding of resistant varieties, particularly of cereals, and the development by mutation of new physiological races of the pathogen. The importance of the correct use of fertilizers is also stressed as lack of care in this respect may lead to an increase in the incidence of rust. In conclusion, recent research work in German laboratories on new and improved fungicides is briefly reviewed.

Hadfield, J. W.
Arable farm crops of New Zealand.
Department of Scientific and Industrial Research, Wellington, New Zealand 1952 : Pp. xi + 332 : 79 figs. : 53 tables.

The author is well known for the prominent part he has played in agriculture in New Zealand, particularly by initiating the seed certification scheme, by inaugurating a breeding programme which has by today brought about the improvement of almost every farm crop, and by his responsibility for the development of the linen-flax industry from its infancy in the second world war. His wide experience has now gone into writing a text book which provides students, extension and research workers, the farmers themselves and the general reader with an account of arable crops and their role in the predominantly pastoral system of farming characteristic of New Zealand. The book is divided into six parts, dealing with (1) cereals, (2) leguminous crops, (3) crucifers, (4) potato and tobacco, (5) linseed and linen flax and (6) miscellaneous crops, viz. mangel, sugar beet and carrot. For each crop detailed information is given on its economic status, cultivation and utilization; accounts of the different varieties used are included. The book contains 79 illustrations, lists of references and a good index. It is a valuable addition to the rather limited number of books on agriculture in New Zealand.

Roemer, T. & Rudorf, W. (Editors).
Handbuch der Pflanzenzüchtung. (**Manual of plant breeding**).
Paul Parey, Berlin & Hamburg 1955 : 2nd Ed. : Lief. 6 : Vol. 1 : Bogen 21–25 : 321–400; Lief. 7 : Vol. 1 : Bogen 26–30 : 401–80; Lief. 8 : Vol. 2 : Bogen 6–10 : 81–160; Lief. 9 : Vol. 2 : Bogen 11–15 : 161–240 : figs. : tables : DM 13.50.

The sixth instalment (cf. p. 323) completes the section on Stoffproduction und Pflanzenzüchtung, dealing particularly with breeding for protein, oil, alkaloids and various secondary products including vitamins. There follows a chapter on Ertragssicherheit [Reliability of yield] by W. H. Fuchs and K. v. Rosenstiel, which includes breeding for resistance to various nonparasitic ailments, including winter hardiness, drought and heat resistance, and for resistance to parasitic diseases. Instalment 7 completes this chapter and begins Natürliche Auslese und Auslesezüchtung [Natural selection and breeding by selection] by T. Roemer, revised by W. Rudorf. The eighth instalment completes the chapter on rye and continues with Mais (*Zea mays*) [Maize (*Z. mays*)] by G. F. Sprague and A. Tavčar, the former author writing in English and devoting himself mainly to maize breeding work in the USA, the second author writing in German about maize breeding for European conditions; this section is completed in instalment 9, which contains the beginning of the section Weizen (*Triticum* L.) [Wheat (*Triticum* L.)]; this is in three parts, the first, on systematics, cytology and genetics by E. R. Sears, and the second, on wheat in North America by E. R. Ausemus, are in English and the third, on wheat breeding in Europe by F. Wienhues, is in German.

31e beschrijvende rassenlijst voor landbouwgewassen 1956. (**Thirty-first descriptive list of agricultural crop plants, 1956**).
Rijkscommissie voor de Sammenstelling van de Rassenlijst voor Landbouwgewassen, Wageningen 1956 : f. 2.00 : Pp. 333 : tables.

The latest edition of this useful and highly recommended reference book has now appeared, together with its English summary. In addition to the usual valuable data on the agronomic merits of individual varieties approved for cultivation in the Netherlands, information is provided as to the source from which seed of new and promising strains may be obtained and on legislation concerning breeders' rights. Appendices giving English, French and German translations of Dutch words for the different crop plants, synonyms and equivalents of varietal names in Dutch and other languages and statistical data on the distribution of varieties in different areas and on different types of soil in the Netherlands are also included.

Stand und Leistung agrikulturchemischer Forschung III. (**Status and results of research in agricultural chemistry III**).
Landw. Forsch., 7. Sonderheft; J. D. Sauerländer's Verlag, Frankfurt am Main 1956 : Pp. 161 : figs. : tables.

This publication comprises a series of lectures delivered to commemorate the centenary of the founding of the Agricultural Research Institute, Bonn University. K. Naumann opened the proceedings with a review of research carried out in the Rhineland during the past hundred years on soil chemistry and the use of fertilizers. He was followed by J. Huber, who spoke on the influence of the Rhineland climate and of the different types of soil found in the Rhineland upon the choice of crops grown there. Later speakers dealt with soil fertility, structure and conservation, the action of frost upon the soil, soil microbiology, the use of fertilizers and green manure, plant nutrition and crop rotation.

ILJIN, W. S.
El agua y los procesos vitales de la planta. (**Water and the vital processes of the plant**).
Colección "Agricultura", Ministerio de Agricultura y Cría, Caracas, Venezuela 1955 : Pp. 96 : 26 tables : plates.

This is the first of a series of popular scientific booklets to be issued by the Venezuelan Ministry of Agriculture. Dealing with the role of water in plant physiology in the widest sense, it contains a brief section on drought resistance of different plants. On the basis of his own experiments and those of a number of other workers, which are reviewed, the author reaches the conclusion that resistance to desiccation is not in itself a true measure of drought resistance, which is the result of a complex of several factors influencing the water relations of a plant.

PEAIRS, L. M. & DAVIDSON, R. H.
Insect pests of farm, garden, and orchard.
John Wiley & Sons, Inc., New York & Chapman & Hall, Ltd., London 1956 : 5th Ed. : 68s. : Pp. viii + 661 : 577 figs. : tables.

This is the sort of textbook the Americans excel at producing: wide in scope, practical rather than academic in outlook, luxurious in production and, by English standards, exorbitant in price. After two preliminary chapters on the structure, development and classification of insects, useful to those with little or no previous knowledge of entomology, there follow chapters on natural insect control, chemical, biological and other kinds of artificial control and methods of preparing and applying insecticides. The remaining sixteen chapters form the main body of the book. The insect pests described are all those commonly occurring in the USA and include not only those causing damage to field crops, greenhouse crops, vegetables and fruits, but also those injurious to stored products, household goods, man and domestic animals. The chapters are arranged according to the crops, products or animals to which the pests described cause most damage, one chapter being devoted to insects with a very wide host range. The descriptions vary in length from a paragraph to several pages, the information given for each insect consisting, usually, of an indication of the host's reaction to attack, a brief description of the adult and earlier stages, an outline of the life cycle, mention of other crops attacked and details of recommended methods of control. Many of the drawings illustrating the text are very good, but the photographic reproductions are on the whole poor and in most of the illustrations there is no indication of the scale. In spite of some lack of detail, unavoidable in a comprehensive work of this kind, this book contains sufficient, well-arranged practical information to make it of value not only as a textbook for colleges but also as a work of reference for any workers concerned with pest control.

BRÜCHER, E. H.
Origen y filogenia de los cereales. (**Origin and phylogeny of the cereals**).
Editorial Acme, S.A.C.I., Buenos Aires 1955 : Pp. 137 : 33 figs.

In this small booklet, a Spanish translation, slightly adapted for South-American readers, of a work that originally appeared in German under the title *Stammesgeschichte der Getreide*, the author, after a brief general introduction, gives an outline of what is known concerning the origin of five of the main cereals, barley, rye, oats, wheat and maize. In considering barley he insists on the phylogenetic distinctness of the two and six-rowed barleys, the former with its centre of origin in western Asia and the latter in eastern Asia; the *Hordeum agriocrithon* forms of Tibet are regarded as closely related to the wild progenitor of *H. polystichum* and the desirability of making further collections, particularly in the area of the China-Tibetan borders, is strongly urged: barleys from this area contain a wide range of characters and are particularly rich in forms of naked barley. The two-rowed barleys are thought to have arisen, probably in the upper Tertiary, by mutation from a primitive barley of the *H. agriocrithon* type, the mutant having been adapted to lower altitudes than *H. agriocrithon* and having therefore migrated more into the plains, westward of the Himalayas, first as *H. spontaneum* and later as cultivated forms of *H. distichum*.

Rye is taken as an example of a plant that evolved as a weed in fields of a main crop, in this case wheat, and the advantages to be expected from radical methods of improvement, particularly polyploidy and intergeneric crossing, are enlarged upon.

Avena strigosa is regarded as a relic of an earlier period when this oat, together with its progenitor *A. hirtula*, was widely grown. The oats with 28 chromosomes originated, it is thought, in Abyssinia and Eritrea, *A. barbata* being regarded as an autopolyploid from *A. hirtula*;

as for the hexaploid oats, *A. fatua* is supposed to have arisen in the steppes of southern Russia and migrated into western Europe, giving rise to cultivated oats by mutations involving a tough rachis. A promising future is foreseen for the production of winter oats by crossing with wild species, the development of improved forms of naked oats, free from the tendency towards shedding, and early-maturing oats, possibly on the basis of *A. byzantina*, for South America and elsewhere.

The Einkorn wheats are thought to have been domesticated in the Danube basin in the Stone Age and the few remaining areas where they are now grown are relics of a much wider area of cultivation; the desirability of saving this material for breeding purposes is urged, on account of its high gluten content and resistance to frost, drought and diseases. *T. dicoccoides* is regarded as a polyploid which arose from Einkorn and in its turn gave rise to the cultivated Emmers in the Mesopotamian area. The author proffers no suggestions regarding the origin of *T. durum* and makes the rather surprising statement that it is the main wheat cultivated in Argentina, the USA and Australia: can this be due to a confusion as to the identity of the hard red wheat of Manitoba? For the origin of *T. aestivum* he accepts the hypothesis of Sears and McFadden and an outline is given of the achievements in breeding this cereal during the present century in the USA, various European countries and Uruguay and Argentina, emphasizing the importance of interspecific crossing and of the material brought together by the various collecting expeditions and world collections; special mention is made of a *Triticum* x *Agropyron* hybrid with 56 chromosomes found by the author to have considerable potentialities as a pasture grass.

The problem of the origin of maize is regarded as still unsolved; the evidence for considering teosinte a hybrid of *Zea* and *Tripsacum* is presented and expression is given to the view that a true wild maize might still be found by exploring the more inaccessible regions of Brazil, Paraguay, Bolivia or adjacent territories, this area being regarded as the most probable centre of origin.

LELLEY, J. & RAJHÁTHY, T.
A búza és nemesítése. (**Wheat and wheat breeding**).
Akadémiai Kiadó, Budapest 1955 : 70 Ft. : Pp. 544 : 67 figs. : 52 tables : 58 plates.

As its title indicates, this book is not concerned only with wheat breeding: it also deals in some detail with the biology, origin and cultivation of wheat. The first third or so of the book deals in turn with the agronomic importance of wheat, its origin and distribution, its taxonomy and morphology, the chemical composition of the grain, the ecological and agronomic requirements of the different species, developmental physiology and the biology of reproduction, while the remainder is concerned with genetics and breeding. The chapter on genetics includes a survey of haploidy, aneuploidy, polyploidy, the inheritance of morphological and other characters and mutation, special attention being given to the use of induced mutation in breeding. Work on interspecific and intergeneric hybridization is dealt with in detail, as is also breeding for disease resistance. Among other topics discussed are methods of breeding and selection, the improvement of quality and the importance of land races and local varieties in breeding. Cytology is dealt with incidentally only and receives no separate chapter.

Detailed descriptions of the main Hungarian wheats are given and notes are provided on some 230 foreign varieties. In addition, a useful appendix gives the pedigrees of about 140 well-known wheats. There are several indexes: an index of scientific names, one of varietal names, an author index and a subject index.

It is a pity that a work of this kind should not have been better produced: the paper is of poor quality and the illustrations, which are collected together in one section at the back of the book, often leave much to be desired.

Lists of the contents and short summaries of the subject matter in English and Russian are provided, but these do little to mitigate the fact that, although this is certainly a valuable reference book, it will, regrettably, be of little use to other than Hungarian readers.

AHLGREN, G. H.
Forage crops.
McGraw-Hill Book Company, Inc., New York, Toronto & London 1956 : 2nd Ed. : 52s. 6d. : Pp. viii + 536 : figs. : tables.

This textbook, the first edition of which appeared in 1949, is intended not only for students but also as a reference work for all those engaged one way or another in the agricultural industry of the United States, as teachers, advisers, producers or members of seed associations and other organizations. With this aim in view, the subject matter is naturally confined to forage-crop production in that country. The introductory section includes four chapters, dealing with the history and development of forage-crop utilization and cultivation, production and use at the present time, climate and soil, and the general characteristics of grasses and legumes. The eight chapters of part II offer information on the cultivation and use of the most important leguminous crops: lucerne, clovers, birdsfoot trefoil, lespedeza, kudzu, vetches, soya bean, cowpea, field pea and peanut. The nine chapters of part III describe the cultivation and utilization of the chief grass species. The remainder is concerned with general subjects, part IV dealing with seed-sowing practices and part V with mineral nutrition, mechanization, management of pastures and ranges, silage making and other aspects of production. The concluding section, entitled Problems and prospects, contains chapters on conservation cropping, pollinating and harmful insects, some important diseases, weed control and the grassland type of farming. The second edition incorporates new material on the production of hay, silage, pastures and seed and several other subjects. As those acquainted with the first edition will have found, the book is an excellent source of basic information on forage-crop production in the United States.

HEINISCH, O.
Samenatlas der wichtigsten Futterpflanzen und ihrer Unkräuter. (**Seed atlas of the most important forage plants and their weeds**).
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin 1955 : DM 195 : Pp. 14 + 122 plates.

The pictures embodied in this seed atlas were originally prepared for Prof. Heinisch for a course of lectures he delivers on the botany of seeds and their publication has been made possible by a grant from the Deutsche Akademie der Landwirtschaftswissenschaften in Berlin. Each species treated is illustrated with an admirable coloured drawing not only of the seed but of the main floral organs and a black-and-white drawing of the plant and individual organs. Brief legends in German, English, Russian and French give information concerning the Latin name and its meaning, the common name in the respective languages, the botanical family to which the species belongs, its habitat, the main characteristics of its fruit and seeds, the main species it infests if it is a weed, and the most characteristic features of the growing plant. The species are arranged in the order of their families but there is an alphabetical index of their Latin names which gives the equivalents in the other languages. As in all works of this kind some doubt attaches to a number of the so-called common names and there are a few inaccuracies in the non-German, particularly the English, text.

HOGEN ESCH, J. A., NIJDAM, F. E. & SIEBENEICK, H.
Dutch potato atlas.
H. Veenman & Zonen, Wageningen 1955 : unpaginated : 46 plates.

The object of this useful book is to enlarge the scope of the varietal descriptions given in the relevant section of the Descriptive list of agricultural crop plants (cf. p. 701) by providing coloured plates illustrating the morphological characteristics of Dutch and foreign potato varieties approved for cultivation in the Netherlands. A single page giving data on botanical and agricultural characteristics, including disease resistance and economic utilization and cooking quality, is devoted to each of the 46 varieties covered and has facing it a coloured illustrated plate portraying the sprout when germinated in diffused light, the fully-grown leaf, the stem, the inflorescence, the tuber and a cross-section of the tuber. The atlas is loose-leafed, thus facilitating the insertion of additional sheets, which will be printed as new varieties are added to the list of approved varieties. The edition under review is in English, but Dutch, German and French versions are available.

MAUER, F. M.
(**Origin and systematics of cotton**).
Izdateljstvo Akad. Nauk Uzbeksk. SSR, Taškent 1954 : 24 r. 50 k. : Pp. 384 : 127 figs. : 9 tables : 4 plates.

The author of this monograph has devoted himself since 1922 to the study of the Soviet cotton collection, which numbers over 4000 specimens, and hybrids involving 50 different interspecific combinations have been obtained and studied.

Cotton cultivation is thought to have had its origins in the Neolithic age and some early references to it in the literature are cited. These are followed by references to early descriptions of cotton species, starting with that of *Gossypium herbaceum* by Ruellius in 1537, and a critical outline is given of the classifications of Linnaeus and his contemporaries and of Rohr, Parlatore, Todaro and others in the nineteenth century. Gammie, Watt and others in the early part of the twentieth are criticized particularly for regarding the African and Indian cottons as having a common origin. A new era was introduced with the investigation of the large world collections of cotton made by Soviet workers; the first cytological studies were published in 1922 by H. G. Nikolaeva and Zaĭcev's classifications in 1925 and 1928; in these the Asiatic cottons, *G. arboreum*, were clearly separated from the African, *G. herbaceum* and the Central American from the South American; his exclusion of the wild cottons from the genus *Gossypium* has however later been shown to be wrong, except for *G. kirkii*; he also overestimated the degree of relationship between the Old and New World cottons. These Soviet studies were followed by similar ones in the West Indies and elsewhere; classifications by Harland, Hutchinson, Silow, Roberty, Prohanov and others are reproduced and criticized. Thus Harland is said to overemphasize the importance of chromosome number and the difference between wild and cultivated species, in consequence of which he separates closely related species such as *G. klotschianum*, *G. davidsonii* and *G. raimondii*. Hutchinson's classification suffers from the attempt to derive all cultivated cottons from one centre in the Indus delta, from the supposition that the closely related wild species such as *G. africanum*, *G. mexicanum* and *G. darwinii* have developed from cultivated forms and from a failure to observe the rules of botanical nomenclature. Prohanov's classification suffers from his loose ideas on the nature of a species and also from his idea of centres of origin. Prohanov's suggestion of removing the genera *Gossypium* and certain allied genera into the Bombacaceae is also considered erroneous, as is the separation of linted and lintless species; forms with naked seeds have been found in many cultivated species of both New and Old World cottons and some wild species have hairs up to 10 mm. and more in length. Moreover, true wild forms have been found belonging to the cultivated species *G. hirsutum*, *G. tricuspidatum*, *G. barbadense*, *G. herbaceum* and *G. arboreum*. Similarly, the presence of unicellular hairs on the septa is regarded as useless as a taxonomic character, having been found in *G. barbadense* and almost all other species, both cultivated and wild.

In studying the endemic species of Australia it has been found that *G. sturtii* crosses successfully with almost all other cotton species, cultivated and wild. No grounds are recognized for excluding the Australian species, and *G. javanicum*, from the genus *Gossypium*; the presence of cotyledon glands is not considered an important diagnostic character and many features possessed in common by the Australian group are enumerated. It is thought possible that all of them may share with *G. sturtii*, the only one examined in the live state, properties such as immunity from *Bacterium malvacearum*, tolerance of temperatures of − 5° to − 7° C. and large chromosomes; the group has nothing in common with *G. stocksii* and *G. anomalum*, which are ascribed to the Asiatic-African group, as is the Arabian species *G. areysianum*. Of the 11 known species of this latter group, the author states, 8 occur in Africa, namely *G. herbaceum*, *G. perrieri*, *G. somalense*, *G. ellenbeckii*, *G. stocksii*, *G. anomalum*, *G. triphyllum* and his new *G. capitis-viridis*; two occur in Arabia, viz. *G. areysianum* and *G. stocksii*, and three in India, *G. arboreum*, *G. bakeri* and *G. stocksii*; on the basis of the international rules this group should be named *Eugossypium*. The species *G. perrieri* from Madagascar is regarded as separate and possibly endemic, especially in view of the sterility of its hybrids with both *G. herbaceum* and *G. arboreum*, and it is thought possible that the Egyptian cottons of the type *G. soudanense* Watt. may be derived from it. The other species from Madagascar, *G. brevilanatum*, belongs more properly to the genus *Gossypioides*. The New World cottons form a natural group and even the $n = 13$ diploid species show greater morphological and physiological analogies with the tetraploid South American species than with the diploid species of the Old World. The South American group as a whole comprises the original subgenus *Karpas* Raf., of which the $n = 13$ chromosome group constitutes section *Integrifolia*; its nine species embrace almost the whole range of variation in the genus and several of its members have been wrongly ascribed to other genera. The interrelationships on hybridization show that the species form a natural group. The five $n = 26$ chromosome species constitute section *Magnibracteolata*. The Brazilian cotton *G. mustelinum* is accorded the rank of a separate species.

Almost all diagnostic characters may overlap between species and it is not possible to distinguish the species on a single character but only in conjunction with their geographical and physiological characteristics.

In its general systematic position *Gossypium* is intermediate between *Thespesia* and *Cienfuegosia*; the former, being a hygrophilic genus, is regarded as more primitive and a probable progenitor, and the latter more advanced and probably derived from *Gossypium*. In the classification here presented the genus *Gossypium* is divided into three subgenera. The first, subgenus *Eugossypium*, is divided into two sections, *Indica* with subsection *Indica* comprising *G. arboreum*, *G. herbaceum* and *G.*

soudanense, subsection *Curtiloba* comprising *G. somalense*, *G. ellenbeckii* and *G. bakeri* and subsection *Anomala* comprising *G. anomalum*, *G. capitis-viridis* and *G. triphyllum*. Section *Pseudopambak* comprises *G. stocksii* and *G. areysianum*.

Subgenus *Karpas* has section *Integrifolia*, with subsection *Integrifolia* comprising *G. davidsonii*, *G. klotzschianum* and *G. raimondii*, subsection *Ingenhouzia* comprising *G. trilobum*, *G. aridum* and *G. gossypioides* and subsection *Caducibracteolata* comprising *G. armourianum*, *G. harknessii* and *G. californicum*; section *Magnibracteolata* comprises *G. hirsutum*, *G. tricuspidatum*, *G. mustelinum*, *G. tomentosum* and *G. barbadense*.

Subgenus *Sturtia* has section *Thespesiastra* comprising *G. thespesioides* and *G. flaviflorum* and section *Hibiscoidea* comprising *G. sturtii*, *G. costulatum*, *G. cunninghamii*, *G. populifolium*, *G. timorense*, *G. australe*, *G. robinsonii*, *G. bickii* and *G. pulchellum*.

The author defends his classification on the basis of the dialectical view of the species as defined by Stalin and Lysenko; individuals belonging to the same species, however different they may look, give highly fertile offspring, whilst those of different species, however alike in appearance, give offspring of low fertility; there is also an absence of intermediate forms between species, even when they overlap in area. Many species are confined to a particular type of soil, for example *G. herbaceum* occurs on arid and alkaline, *G. arboreum* on moist, neutral or acid soils; *G. hirsutum* occurs on drier, neutral or alkaline soils and *G. tricuspidatum* on moist acid soils; it is possible that in each case the one species has developed from the other. Species such as the narrowly specialized *G. stocksii* and *G. areysianum* are regarded as relics, whereas species such as *G. harknessii*, *G. armourianum* and *G. trilobum* are considered to be young species that are still developing. On account of their long period of isolation and different ecological adaptation *G. davidsonii* from Mexico and *G. klotzschianum* from the Galápogos islands are regarded as distinct, though related, species. In this classification the wild species are subdivided into subspecies and varieties; the cultivated species are subdivided into subspecies, geo-ecological groups, sortotypes (groups of related agricultural varieties), agricultural varieties and land races; the last category may comprise several morphological types referred to as forma. General descriptions are given of the morphological characteristics of the genus and of the geographical distribution of its species. The majority of the wild species are xerophytes, the New World species with $n = 26$ chromosomes being adapted to somewhat more humid zones; only *G. sturtii* and *G. trilobum* will tolerate frosts (down to − 10° C.). The three subgenera have distinct areas, *Karpas* in the New, *Eugossypium* in the Old World and *Sturtia* in Australasia. No intermediate or closely related forms occur. The greatest polymorphism is found in the New World subgenus, which reaches its greatest diversity in lower California and Mexico; in the Old World group the greatest diversity is in Africa, in the area of Somaliland, and in the littoral of the Indian Ocean, in southern Arabia and western India; and in the Australasian group in northern and north-western Australian along the coast of the Timor Sea. The only wild species with a wide distribution are *G. anomalum* and *G. herbaceum*, *G. hirsutum*, *G. tricuspidatum* and *G. barbadense*. The area of *G. stocksii* is discrete, in Somaliland, southern Arabia and Sind. The existence of the three subgenera in distinct areas testifies to their antiquity; any similarities that exist between certain species of sections *Magnibracteolata* and *Indica* relate to individual characters only and do not indicate any close degree of affinity, as is borne out by the crossing relationships. Within the subgenus however vicariation is frequent, as in the case of *G. davidsonii* in Mexico, *G. klotzschianum* in the Galápogos islands and *G. raimondii* in Peru: all three species are endemic and show clear distinctions in many features though similarities in many others; they probably arose from a common ancestor after the separation of their areas in relatively recent times. The five polyploid species of section *Magnibracteolata* provide a similar example, *G. tomentosum* being endemic to Hawaii, *G. hirsutum* to Mexico, *G. tricuspidatum* to the Antilles, *G. mustelinum* to Brazil and *G. barbadense* to Peru; their separation dates probably from an earlier time, whilst *G. harknessii*, *G. armourianum* and *G. californicum* are cited as an example of more recent separation. Instances from the Old World group are *G. arboreum* and *G. herbaceum*, and possibly *G. perrieri* in subsection *Indica*, *G. anomalum*, *G. capitis-viridis* and *G. triphyllum* in *Anomala* and *G. somalense*, *G. ellenbeckii* and *G. bakeri* in *Curtiloba*.

Existing data on the cytology of *Gossypium* and certain related genera are summarized; they include a number of investigations by workers in the Soviet Union on chromosome morphology. These confirm the exclusion of *G. kirkii* from the genus *Gossypium* and show that the chromosomes of the New World species *G. davidsonii* are equal in size to those of the Old World species *G. anomalum* and smaller than those of *G. trilobum* and *G. armourianum*. A certain similarity was observed between the large chromosomes of *G. hirsutum* and *G. barbadense* and those of *G. herbaceum* and *G. arboreum* and between the small chromosomes and those of *G. armourianum* and certain other New World species but the resemblance was not complete. The diploid New World cottons have two pairs of chromosomes with satellites whereas the small chromosomes of the tetraploid species have only one pair; the Old World diploids *G. herbaceum*, *G. arboreum* and *G. anomalum* have two pairs of satellited chromosomes with equal arms and one pair with unequal arms whereas the tetraploid species have only the one pair with unequal arms and none of the former type. Thus the evidence does not favour the view of the hybrid origin of New World cottons. Cytological characteristics are regarded as only one among the many diagnostic characters and are only thought to be of value when taken in conjunction with all the others. On the basis of their chromosomes the species arrange themselves in five main groups, viz. I the tetraploids, II the diploid New World species, III *G. herbaceum*, *G. arboreum* and *G. anomalum*, IV *G. stocksii* and V *G. sturtii*.

The author discusses the role of the lint in facilitating germination, the influence of light, temperature and other factors on growth, development and flowering and the various possibilities of interspecific hybridization, natural and artificial. In the Soviet territories natural hybridization between *G. barbadense* and *G. hirsutum* occurs with a frequency of 1–5% though under certain circumstances it may be as much as 12%. Crossing between *G. herbaceum* and *G. arboreum* is slightly less frequent. Crosses between Old and New World species such as *G. hirsutum* x *G. herbaceum* and *G. hirsutum* x *G. arboreum* have been observed but are more rare, only 0·024% having been observed in mixed sowings of *G. hirsutum* and *G. herbaceum* in 1928–29. Charts are presented showing the results of artificial crossing in different interspecific combinations, based on the author's own experiments combined with data published in the literature (Tables 5 and 6). In the author's crosses seed was set in 50 of the 66 combinations, 18 of them in both directions and 32 in one only; hybrids were obtained in certain combinations not reported in the literature, viz. *G. hirsutum* x *G. stocksii*, *G. tomentosum* x *G. sturtii*, *G. tomentosum* x *G. armourianum*, *G. tomentosum* x *G. trilobum*, *G. armourianum* x *G. anomalum*, *G. davidsonii* x *G. armourianum*, *G. trilobum* x *G.stocksii*, *G. anomalum* x *G. sturtii* and *G. sturtii* x *G. anomalum*. Hybrids of *G. davidsonii* x *G. armourianum* are quite fertile, showing that subsection *Integrifolia* is more closely related to other New World species than had been supposed. No crosses between *G. kirkii* and any species of *Gossypium* have been obtained. Hybrids of *G. herbaceum* x *G. stocksii* and *G. herbaceum* x *G. trilobum* are among the least vigorous vegetatively; *G. trilobum* x *G. davidsonii*, *G. davidsonii* x *G. stocksii*, *G. hirsutum* x *G. davidsonii*, *G. barbadense* x *G. davidsonii* and certain others all died in the seedling stage and the success of many combinations varied according to the variety of each species used as parent. Ease of crossing and vigour of the hybrids do not necessarily constitute a measure of relationship; thus the Australian *G. sturtii* crosses easily with almost all species, whilst *G. davidsonii* crosses more readily with certain Old World species, e.g. *G. anomalum*, than with the tetraploid New World species. Crossing relationships in *G. darwinii* were identical with those of *G. barbadense* and the two species are therefore combined. On the other hand *G. tomentosum* crosses less readily than the other tetraploid species and is regarded as distinct. *G. trilobum* and *G. aridum* cross less readily with *G. hirsutum* than the other species of section *Integrifolia* and these two species stand closer to *G. armourianum* and *G. harknessii* on the one hand and to *G. klotzschianum* and *G. davidsonii* on the other. The most difficult species to cross with both New and Old World species is *G. stocksii* and *G. somalense* seems to be more closely related to *G. stocksii* than to *G. arboreum*.

Some of the more difficult interspecific crosses were achieved only by the use of Mičurinist methods in making the cross, one of the most successful being grafting on a weakly growing rootstock; the best results were obtained at temperatures round 25%.

In discussing the origin of the cotton species it is pointed out that the five tetraploid species are all adapted to more humid conditions than the diploid species. They are thought to have arisen in response to an increase of humidity in the climate in the central portion of the American continent after its separation from the Old World. The remaining diploid species survived in the more arid regions of the New World, e.g. the Pacific coast of North and South America. The tetraploid *G. tomentosum* is thought to have arisen independently after the separation of the Hawaii archipelago. The northern group of tetraploid cottons, consisting of *G. hirsutum* and *G. tricuspidatum*, in Mexico, Yucatan and the Caribbean islands, has been isolated from the southern group, consisting of *G. barbadense* on the Pacific shores and *G. mustelinum* in Brazil, from the earliest times; the two groups are thought to have arisen independently, from different diploid progenitors. These progenitors were however species belonging to the New World subgenus *Karpas*, as shown by the fact that all the tetraploid cottons are interfertile, and no grounds are recognized for the hypothesis that they arose by hybridization with Old World species, which have been separated from them since the Tertiary period, before the origin of man and agriculture. The experimentally produced amphidiploids and certain trispecific hybrids, e.g. (*G. barbadense* x *G. trilobum*) x *G. arboreum* or (*G. hirsutum* x *G. armourianum*) x *G. arboreum*, while showing certain morphological resemblances to the tetraploid New World cottons, have had highly irregular offspring and lend no support to the hypothesis of Skovsted, Hutchinson and others concerning the origin of the tetraploid cottons. The present author derives the whole of the genus *Gossypium*, together with *Thespesia*, *Kokia* and other related genera, from a Cretaceous ancestral genus *Palaeogossypium*, which was probably a tree-like, nondeciduous forest type resembling the modern *Thespesia*. One section of this genus evolved in the direction of xerophytism and gave rise to *Gossypium*. Most of these species and those of allied genera retained a common caryotype, with $n = 13$, and their evolution took place in response to changed environment in the territories in which they evolved. After the continent of Australia separated, the subgenus *Sturtia* began to evolve, an event which cannot have been later than the middle of the Cretaceous period. The remaining material evolved into subgenera *Karpas* in the western and *Eugossypium* in the eastern parts of its range; the western group moved over with the American continent when it separated probably towards the end of the Cretaceous period and later evolved into the three subsections *Integrifolia*, *Ingenhouzia* and *Caducibracteolata*. The tetraploid species separated into different groups as described above, probably in the Eocene when the Panama isthmus was submerged. The diploid group *Integrifolia* separated at the same time into *G. raimondii* in the Andes, *G. davidsonii* in Mexico and from it, after their separation, *G. klotzschianum* on the Galápogos islands. The tetraploid *G. tomentosum* arose at the same time or possibly earlier, after the Hawaii archipelago had separated. Also in the Eocene the subgenus *Eugossypium* separated into the Indian group on the one hand and the Africa-Madagascar group on the other, with a number of vicarious species as described above and *G. stocksii* with a discrete area, in Somaliland, southern Arabia and Sind.

In this scheme *G. taitense* is considered to be a form of *G. hirsutum* brought to Polynesia in historical times; this is supported on linguistic grounds. *G. darwinii* is closely related to *G. barbadense* and has probably been introduced on to the islands also in historical times. Thus there is no Polynesian group of cottons as such and the idea of a transoceanic migration of cotton from one continent to the other is dismissed as improbable. The presence of *G. tomentosum* in the Hawaii archipelago is taken as a demonstration that the archipelago was once joined to the mainland.

The discovery of cotton fabrics at Mohenjo Daro in Sind, dating back some 5000–5500 years, shows the antiquity of cotton cultivation in India; evidence is also cited showing that *G. herbaceum* was cultivated in Egypt before 1000 BC and in Turkestan in the early centuries of our era, before the advent of the Arabs, the opinion being expressed that the cultivation of this species originated in Africa and that it was taken from there into Asia *via* Abyssinia and southern Arabia at some time not later than 1000 BC; it also spread into Asia Minor, southern Europe and elsewhere. The cotton which was cultivated in America before the conquest apparently belonged to local species such as *G. hirsutum*. An examination of the wild forms of the main cultivated species shows them to be geographically separated, *G. arboreum* on the north-western shores of the Indian peninsula, *G. herbaceum* in southern Africa, *G. hirsutum* in southern Mexico, *G. tricuspidatum* in the Antilles and possibly the north-eastern shores of S. America, *G. barbadense* in the Andes and the Galápogos islands, *G. perrieri* in south-western Madagascar and *G. mustelinum* in north-eastern Brazil. Cotton cultivation probably arose independently in each of these seven areas. Selection was carried out sometimes consciously, sometimes unconsciously, and led to the development of forms with coloured leaves, annual habit, early maturity, sympodial growth, ease of germination of seed, adaptation to a wide range of climatic conditions, greater boll size and yield and better quality lint; only four species, *G. arboreum*, *G. herbaceum*, *G. hirsutum* and

G. barbadense, have lost their tropical, short-day habit but the general lines of evolution have been the same in all seven of the cultivated species. The first to be taken into cultivation was *G. arboreum* in India; it spread mainly in a north-easterly direction. *G. herbaceum* spread from south-eastern, and possibly south-western Africa, and spread even in prehistoric times through the whole of Africa and into Iraq, Iran and north-western India, later reaching eastern Turkestan, north-western China and the Mediterranean countries; its establishment in Egypt was relatively late owing to competition with flax. In the New World *G. hirsutum* was taken into cultivation in prehistoric times in southern Mexico and Yucatan, whence it spread across Panama to the south and northwards to Arizona, Florida, and the Antilles and Bahamas; after the discovery of America this species spread into the areas of the other species and has replaced or is replacing them in most of the cotton-growing areas of the world. The other New World species, *G. barbadense*, was taken into cultivation in the Andes region, also before the discovery of America, and spread *via* Paraguay, Brazil and Colombia to the Atlantic coast and thence to the West Indies. After the discovery of America it spread to a number of other places too, including the USSR where a number of early-maturing forms of it have been selected. *G. tricuspidatum* was taken into cultivation in prehistoric times on the Atlantic coast of S. America and in the Antilles, where a great number of forms (vars. Marie-Galante, Pajarito, Mocó, etc.) are still to be found. It is possible that some forms of *G. perrieri* have spread from Madagascar to the African continent (*G. soudanense*?); *G. mustelinum* is possibly used only in the wild state.

Part II of the book is devoted to the systematics of the species of *Gossypium* and their subdivisions. Subspecies are established on the basis of whether the form is a true wild form, a semiwild form found in the neighbourhood of human habitations, a tropical cultivated form or a subtropical cultivated form; ecologo-geographical subgroups are established within the cultivated subspecies, botanical varieties in the wild species where they are known to be sufficiently polymorphic. A key is presented for the identification of these various categories and in the succeeding section each of the species, with its respective subspecies, is described and illustrated. The descriptions include an account of the physiological properties of the species, their agronomic characteristics, including resistance to diseases, and their crossing relationships, geographical distribution and varietal diversity. In the section on *G. hirsutum* ssp. *euhirsutum* descriptions are given of the main varieties of cotton cultivated in the Soviet Union. These first of all consisted of mixtures, each adapted to a particular climatic zone; until 1927 or 1928 some of them still comprised the original cottons of this area, belonging to *G. herbaceum* ssp. *euherbaceum* but these have been gradually replaced by the introduced cottons of the type *euhirsutum* and *eubarbadense*. The former are classified into three main ecological groups or proles, the Central Asian, the Transcaucasian and the North-Caucasus-Ukrainian; each proles is divided into a number of subproles. The southern group contains such varieties as Navrockiĭ, Kolhoznik 8517, Boljševik 2034 or Šreder 1306, and a number of newer varieties and hybrids characterized by greater earliness, yield, resistance to *Verticillium* and bacterial wilt, lint length or suitability for mechanized harvesting. The Transcaucasian group contains several older varieties such as Pioner 915 [Pioneer 915] and a number of newer varieties improved in wilt resistance and other qualities. The third group comprises varieties adapted to the southern part of European Russia and characterized by extreme earliness; they ripen in 110–130 days and are adapted to a relatively long day of up to 15·5 hours. The section devoted to *G. barbadense* ssp. *eubarbadense* contains similar descriptions of the Soviet varieties of this species, all of which have been developed since 1924. All are superior to the Egyptian varieties in yield, giving up to 30–50 c. of cotton per ha. in some farms, and are 5–10 days earlier in maturity. They are divided into two proles, the Central Asian and the Azerbaijan, the former being adapted to a hot continental climate and ripening in 135–165 days, the latter to a more temperate continental climate and ripening in 130–150 days; the latter group is more resistant to virus and bacterial infection, the former to *Fusarium*. Considerable advances in the improvement of existing cotton varieties are foreseen from the use of a more extensive range of wild species in breeding work.

HARLER, C. R.
The culture and marketing of tea.
Oxford University Press, Cumberlege : London 1956 : 2nd Ed. : 25s. : Pp. xi + 263 : tables.

The second edition has been completely rewritten as only in this way could the fundamental changes which have affected every aspect of the tea industry since publication of the first edition in 1933 be described adequately (cf. *PBA*, V, p. 69). The book, which has been written chiefly with the planter and layman in mind, now comprises three parts, the first dealing with the characteristics of the plant itself and its production and also the chemistry and pharmacology of tea, the second with production in various countries of the world and the third with the trade. The chapter on the plant in part I includes appropriately fuller accounts of varieties and agrotypes and of selection. As before, cultivation and manufacture in north-eastern India receive the most detailed treatment. Accounts of tea production and its potentialities are included for a number of countries not previously dealt with, e.g. Malaya, Iran, Turkey, Africa and the USSR. Part III contains chapters on the development of the industry, tasting, marketing, and production, export and consumption, and a final chapter in which the author summarizes his general conclusions concerning the cultivation, manufacture and economics of tea. Unlike the first edition, the second contains no illustrations and maps. Inclusion of a list of the more important sources upon which the author has drawn for his information would have been of service to readers stimulated by this useful book to intensify their knowledge of particular aspects.

COSTE, R.
Les caféiers et les cafés dans le monde. Tome premier. Les caféiers. (**The coffee plants and coffees of the world. Volume I. The coffee plants**).
Editions Larose, Paris 1955 : 7,000 fr. + postage 170 fr. : Pp. 381 : 106 figs. : 93 tables : 74 plates.

This detailed and factual exposition of the cultivation of the coffee plant should prove of considerable value to all interested in the practical aspects and history of a crop that has achieved such importance in the course of the present century. Although a considerable amount of literature on diverse aspects of the subject has been published in recent years, this is probably the first work to deal in such detail with the general agriculture of the coffee plant on a world scale. The writer, a well-known authority with a distinguished career in the French territories overseas, naturally bases the subject matter of his book on his own personal experiences in those parts of the world in which he has worked or which he has visited but also includes a wealth of valuable information culled from the literature. The result is an up-to-date and, above all, practical synthesis of all that is known on the botany, biology, cultivation and parasites of the genus *Coffea*.

The introduction deals with the economic aspect of coffee cultivation and provides figures on the production and consumption of coffee in different countries. In discussing future prospects, the author points out that world consumption of coffee is on the increase, whereas that of tea is stationary, and expresses the opinion that the immediate outlook for the industry is bright, the use of new pedigree planting material and improvements in agricultural technique, especially in the more backward coffee-growing areas of French Africa, holding promise of a very considerable increase in production in the years to come. Chapter I is devoted to a discussion of the history of the cultivation and use of coffee and its gradual spread from tropical Africa to Arabia and from there, in the course of the seventeenth to nineteenth centuries, to other parts of the globe. Chapter II then deals with the botany and systematics of the genus *Coffea*, listing all the principal species and varieties and giving notes on where each is grown and its economic importance, if any. Photographs of the flowers, berries and seeds of the more important economic types show very clearly the wide range of botanical forms in existence. In chapters III and IV the writer proceeds to an account of the biology and ecological requirements of the cultivated varieties and their distribution throughout the world. Chapter V provides a succinct review of means of propagation and includes a number of hints on the best methods of grafting and budding and information on techniques employed in different countries. The next four chapters are devoted to practical aspects of coffee cultivation, such as choice of suitable land, planting, soil conservation, pruning and training, the use of fertilizers and the importance of shade trees. In chapters XI and XII the author turns to diseases and insect pests, their symptoms and methods of control. Chapter XIII discusses the harvesting of the crop. In the concluding chapter, the author elaborates upon the importance of breeding in improving, *inter alia*, yielding capacity, the quality of the beans and disease resistance, discusses progress that has been made in recent years in French Africa and elsewhere and mentions briefly the criteria used in mass and pedigree selection. Coffee research stations throughout the world are listed and mention is made, in each case, of their past achievements and current research.

As may be gathered from the above, there is no major aspect of coffee cultivation that has been left untouched in this impressive work. In addition, the comprehensive bibliographies at the end of each chapter provide ready reference to other works on specialized subjects that the reader may wish to delve into more deeply. The information given is presented in a lucid and coherent manner and the value of the publication is considerably enhanced by the large number of attractive plates that are included.

Topf, H.
Der Löwenzahn. (**The dandelion**).
Die neue Brehm-Bücherei, Wittenberg 1956 : DM 2·25 : Pp. 48 : 44 figs.

This short monograph is devoted primarily to a study of the common dandelion, *Taraxacum officinale*, but mention is also made of the rubber-producing *T. kok-saghyz* in central Asia. The author deals firstly with the geographical distribution of the species and the wide range of vernacular names it has acquired in different countries. The morphology and chemical composition of the roots, leaves, flowers and seeds are described in detail and reasons for the success of the dandelion in competition with other plant species are discussed. In the sections dealing with the practical uses to which the plant, commonly regarded as a troublesome albeit attractive weed, may be put, mention is made of its value in medicine and as a source of vitamin C, especially in France and Belgium where it is grown on a commercial scale as an early vegetable for salads. Wine may be made from the flowers and a coffee substitute from the roots, which also produce an ethereal oil used in the manufacture of liqueurs. Finally the dandelion, although multiplying parthenogenically, produces considerable amounts of pollen and nectar and thus renders a valuable service to the bee-keeper, especially in early spring before most other plant species commence flowering.

The author succeeds in presenting an intriguing account of a frequently neglected aspect of a plant which, although known to everyone by sight, usually arouses little comment, except possibly from the gardener unable to eradicate it from his flower-beds and consequently loath to give it due credit for its remarkable tenacity, powers of regeneration and ability to adapt itself to a wide range of environmental conditions. The book is well illustrated and, like other works in this series, is written in an interesting style.

Falkenberg, H.
Forstunkräuter. (**Forest weeds**).
Die neue Brehm-Bücherei, Wittenberg 1956 : DM 3·75 : Pp. 84 : 55 figs.

This handbook contains all the necessary information for identifying the more important of the weeds usually found in forests and should prove both of practical value to the forester and of general interest to the naturalist. After giving a precise definition of what constitutes a forest weed and the extent to which such weeds, if not kept under control, may jeopardize the economic exploitation of valuable woodland, the author goes on to give succinct descriptions, aptly illustrated by photographs, of nearly fifty species of weeds commonly met with in German forests. Their ecological requirements and their sociological relationship to the forest of which they are part are also dealt with in a competent manner and methods of control, although not forming an important part of the subject matter of this book, are mentioned briefly.

Pjatnickiĭ, S. S.
(**Oak breeding**).
Goslesbumuzdat, Moskva-Leningrad 1954: 4 r. 85 k. : Pp. 148 : figs. : tables. [Russian].

Observations on oaks characterized by early and late leaf emergence respectively have shown these to be hereditary properties and in crosses early emergence is dominant to late. Data of various investigators show that the late form tends to occur on rich moist soils in low-lying areas and the early form on dry soils higher up the slopes; the early form is less tolerant of the spring frosts that occur frequently in the valleys but is more drought resistant; its wood is somewhat lower in quality. The fact that the early and late forms occur throughout the area of the species, together with the existence of innumerable intermediate forms, is taken as evidence against the supposition that they once represented distinct subspecies of *Quercus robur* and they are thought to be ecotypes having developed in response to different sets of ecological conditions. In analysing the possibilities of improving oaks by selection it is stated that most quick-growing mother trees transmit this property to their offspring even when exposed to the risk of cross pollination with slow-growing trees. The method of planting in pockets is recommended too, as it enables the fastest growers to survive by a combination of natural and artificial selection: of the 20–25 trees in the pocket only 1–2 are left to mature. Drought resistance can be increased by selecting individuals from arid habitats and resistance to salinity by selecting those from saline areas.

In discussing distant hybridization it is stated that 107 natural interspecific crosses are known in the genus *Quercus*, the majority of which are fertile; a very brief review of the literature on artificial hybridization is followed by a summary of the Mičurin principles of choice of parents and descriptions of the species of *Quercus* that have been used for crossing in the USSR, with details of their floral biology; observations of the author are cited which show that a great number of flowers remain unpollinated and that a large number of those pollinated are fertilized by pollen from the same tree. In artificial pollinations the pollen from other trees germinates more successfully. For artificial germination a 0·4–0·6 N solution of sucrose was the most successful for species in sections *Cerris*, *Mesobalanus* and *Lepidobalanus* and 1·0 N for *Q. borealis* in *Erythrobalanus*; germination was stimulated by the presence of the stigma or extracts from it and by folliculin; a slight stimulating effect was exerted by boric acid and vegetative tissues of oak or even quite unrelated species. The best conditions for preserving pollen have been found to be in an atmosphere of 60% humidity, obtained with 35% sulphuric acid, at 0° C., in which conditions viability can be retained for 66 days. Most of the species examined have proved to be somewhat protandrous, though the peak of the flowering in male and female inflorescences is almost simultaneous.

General directions are given concerning the technique of hybridization and control of flowering time for interspecific crosses. In crossing work started in 1937 over 142,000 crosses were performed and over 10,000 hybrid acorns produced and a table is presented showing the percentage success in the different specific combinations. Out of 43 combinations only 9 gave no set at all, the least successful combinations being those in which *Q. borealis* and *Q. montana* served as seed parents. The results show that *Q. suber* ♀ in section *Cerris* has a high degree of compatibility with *Q. macrocarpa* and a medium degree with *Q. macranthera* in *Mesobalanus*, with *Q. alba*, *Q. montana* and *Q. borealis* and with the species of section *Lepidobalanus*. *Q. macranthera* ♀ in section *Mesobolanus* was highly compatible with *Q. robur*, *Q. suber*, *Q. alba*, *Q. macrocarpa* and *Q. borealis* and less with *Q. montana*. In section *Lepidobolanus*, *Q. robur* ♀ was highly compatible with *Q. fastigiata* and less so with *Q. macrocarpa* and *Q. montana* in section *Lepidobolanus* and with *Q. suber* and *Q. borealis* in other sections while with *Q. alba* in its own section it had very low compatibility; *Q. fastigiata* ♀ displayed low compatibility with *Q. macranthera* and *Q. borealis*; *Q. macrocarpa* ♀ was incompatible with *Q. suber*, only slightly compatible with *Q. macranthera* and less still with *Q. robur* and *Q. borealis*; and *Q. montana* ♀ was incompatible with *Q. suber* and with species of sections *Lepidobolanus* and *Erythrobolanus*. In section *Erythrobolanus*, *Q. borealis* ♀ was incompatible with *Q. suber*, *Q. alba* and *Q. macrocarpa* and only slightly compatible with *Q. macranthera*, *Q. robur* and *Q. montana*. From these results it is concluded that species belonging to sections *Cerris* and *Mesobolanus* have a greater capacity for crossing with other species than those of other sections.

Morphological descriptions and illustrations of the F_1 hybrids of the following crosses are presented: *Q. robur* x *Q. alba*, *Q. robur* x *Q. borealis maxima*, *Q. robur* x *Q. macranthera*, *Q. robur* x *Q. macrocarpa*, *Q. robur* x *Q. montana*, *Q. robur* x *Q. suber*, *Q. macranthera* x *Q. alba*, *Q. macranthera* x *Q. borealis maxima*, *Q. macranthera* x *Q. macrocarpa*, *Q. macranthera* x *Q. montana*, *Q. macranthera* x *Q. robur*, *Q. macranthera* x *Q. suber*, *Q. macrocarpa* x *Q. borealis maxima*, *Q. macrocarpa* x *Q. macranthera*, *Q. macrocarpa* x *Q. robur*, *Q. robur* x *Q. fastigiata* and *Q. fastigiata* x *Q. robur*.

From these descriptions and a tabular analysis of the inheritance of individual characters in the different crosses it is seen that some hybrids resembled one or other of the parents, some were mainly intermediate, some displayed new characters not present in the parents and some showed mosaics of the parental characters; in many crosses variation in the expression of parental characters was observed between different seedlings of the same combination or in the same seedling from year to year or in the course of development. Reciprocal hybrids frequently differed and in some combinations the hybrids in each case resembled the pollen parent, in others the seed parent; certain characters such as bud colour, length of petiole and form of leaf lobe are mentioned as usually corresponding to the seed parent in all crosses; others, such as form of buds, leaf blade and stipules, shoot colour and pubescence of stipules are usually intermediate whilst other characters are listed which may follow one or other parent or be intermediate, according to the cross. Many species transmit their characters differently according as to whether they are used as seed or pollen parent; thus *Q. robur* as seed parent invariably transmits its characteristics in colour and pubescence of buds, presence of stipules, pubescence of petioles, form of leaf lobes, colour and pubescence of leaf blade and type of venation and usually also pubescence of shoots, length of petioles, number of leaf lobes, depth of incision and form of main leaf lobe, whereas thickness and colour of shoots and form of buds and leaves and leaf size are rarely transmitted. When *Q. robur* serves as pollen parent it invariably transmits petiole length, depth and form of leaf incisions, colour of the upper surface of leaf and type of venation, whilst thickness and pubescence of petioles, leaf form, number and form of lobes, colour and pubescence of upper leaf surface and form of leaf base are not always transmitted and shoot colour and form and colour of buds are rarely transmitted. Similarly *Q. macranthera* as seed parent almost invariably transmits bud colour but rarely shoot colour, form and pubescence of buds, number and form of leaf lobes or colour of leaf and never transmits thickness and pubescence of shoots, retention of stipules, pubescence of petiole, form, pubescence and size of leaves and type of venation, whereas as pollen parent it transmits bud colour and retention of stipules only occasionally and other characters not at all. *Q. macrocarpa* as seed parent transmits leaf size, type of leaf base and venation, occasionally also shoot colour, very rarely thickness of shoot, length of petiole, leaf form, number and colour of lobes and never pubescence of shoots, bud form, retention of stipules, pubescence of petiole, form of leaf incisions and colour and pubescence of lower surface of leaf; as pollen parent it transmits pubescence of buds, form of leaf base and type of venation and usually also shoot colour, more rarely thickness of shoots, form of buds and leaves, retention of stipules, number of lobes and colour and pubescence of leaves. Characters not present in the parents appeared in crosses with *Q. borealis*, *Q. suber* and *Q. macrocarpa* and many hybrids displayed heterosis. Species that tended not to transmit their characters to the hybrids with other species were *Q. macranthera*, *Q. macrocarpa*, *Q. alba*, *Q. montana*, *Q. borealis* and *Q. suber*.

Measurements of transpiration made on three trees of *Q. robur* showed that this species lost up to 600 mg. of water per $dm.^2$ of leaf per hour during the day, whereas in *Q. wyssotskyi* (= *Q. macranthera* x *Q. robur*) the loss was 30–40% less; in *Q. miczurinii* (= *Q. macranthera* x *Q. borealis maxima*) it was 21% less whilst in *Q. komarovii* (= *Q. macranthera* x *Q. alba*) and *Q. timirjasevii* (= *Q. macranthera* x *Q. macrocarpa*) it was greater than in *Q. robur* though the amount of water lost per unit of stem circumference was less. All these hybrids are thus considered more drought resistant than the common oak, the most resistant of them all being *Q. wyssotskyi*. This hybrid proved also to have a 64% higher rate of photosynthesis in the leaves than the common oak, combined with a higher rate of growth.

The most promising hybrids are being reproduced for planting by repeated crossing of the parental species to produce hybrid seed and by means of cuttings treated with α-naphthylacetic acid; the best methods of raising the cuttings are described.

Jakuškin, I. V. & Čmora, N. J.
(The potato).
Jos. Izdateljskvo Seljskohozjaĭstvennoĭ Literatury, Moskva 1955 : 4 r. 60 k. : Pp. 262 : figs : tables. [Russian].

This book on the potato is a guide for second-year students in a three-year course for collective farmers. It contains chapters on the botany of the potato, its cultivation, seed production, cropping under irrigation, summer planting, storage and ensilage and the main diseases and pests to which the potato is subject in the USSR.

NEW JOURNALS

Biota.

The above journal is being published by the Instituto Salesiano "Pablo Albera", Magdalena del Mar, L. Prado 520, Perú. It is devoted chiefly to plant and animal taxonomy. The first volume contains articles on potato taxonomy by C. Ochoa (cf. Absts. 3467 and 3469). Exchange with other publications is solicited.

Bulletin of Brewing Science.

The above journal is being published by the Jozokagaku Kenkyusho [Brewing Research Institute], Tokyo. The articles are in Japanese with English summaries. Besides dealing with brewing technology, the journal concerns itself with the breeding of malting barley and hops (cf. Absts. 3315, 3326 and 3328).

Experimental Husbandry.

The chief purpose of this journal is to give accounts of the work carried out at the experimental husbandry farms of the National Agricultural Advisory Service for England and Wales and on cooperating commercial farms; these experiments include variety studies. The work of other trial centres will also receive attention. Among the articles in the first issue is A comparison of three varieties of barley at three levels of manuring by P. J. Jones, describing an experiment on Spratt Archer, Kenia and

Proctor at the Norfolk Agricultural Station, Sprowston. Nitrogenous manuring of wheat by D. W. Beesley and E. R. Bullen includes a brief account of varietal responses in tests in the eastern and west-midland counties; Preliminary experiments on the drying pea crop by A. C. Owers and A. H. Yule includes a report of variety trials at the Terrington St. Clement Experimental Husbandry Farm, near King's Lynn, Norfolk. Published by the Ministry of Agriculture, Fisheries and Food, Whitehall Place, London, S.W.1, the journal costs 3s. per copy.

Bulletin of the Faculty of Agriculture, University of Miyazaki.

The Agricultural Faculty of the University of Miyazaki, which serves the prefecture of Miyazaki in Kyushu, the most southern of the larger islands of Japan, is issuing a new publication with the above title. The articles deal with all aspects of agricultural research in progress in Miyazaki. An article on ramie by Katayama is summarized in Abst. 3541. The papers are in Japanese; most have an English summary.

Memoirs of the Faculty of Agriculture, University of Miyazaki.

In addition to the Japanese publication referred to above, the Faculty of Agriculture of Miyazaki University is also bringing out a series of memoirs in English. The general scope of the two series is similar.

Grana Palynologica.

The above journal consists of original articles and reprints from different journals and is devoted to palynology in a broad sense, particularly to the basic aspects of this science. Numbers will appear as and when material becomes available for them and the cooperation of taxonomists, morphologists, cytologists, geneticists and geologists is invited. Further information may be obtained from Almquist and Wiksell, Import and Export Department, 26 Gamla Brogatan, Stockholm, Sweden. (Cf. Abst. 3027.)

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